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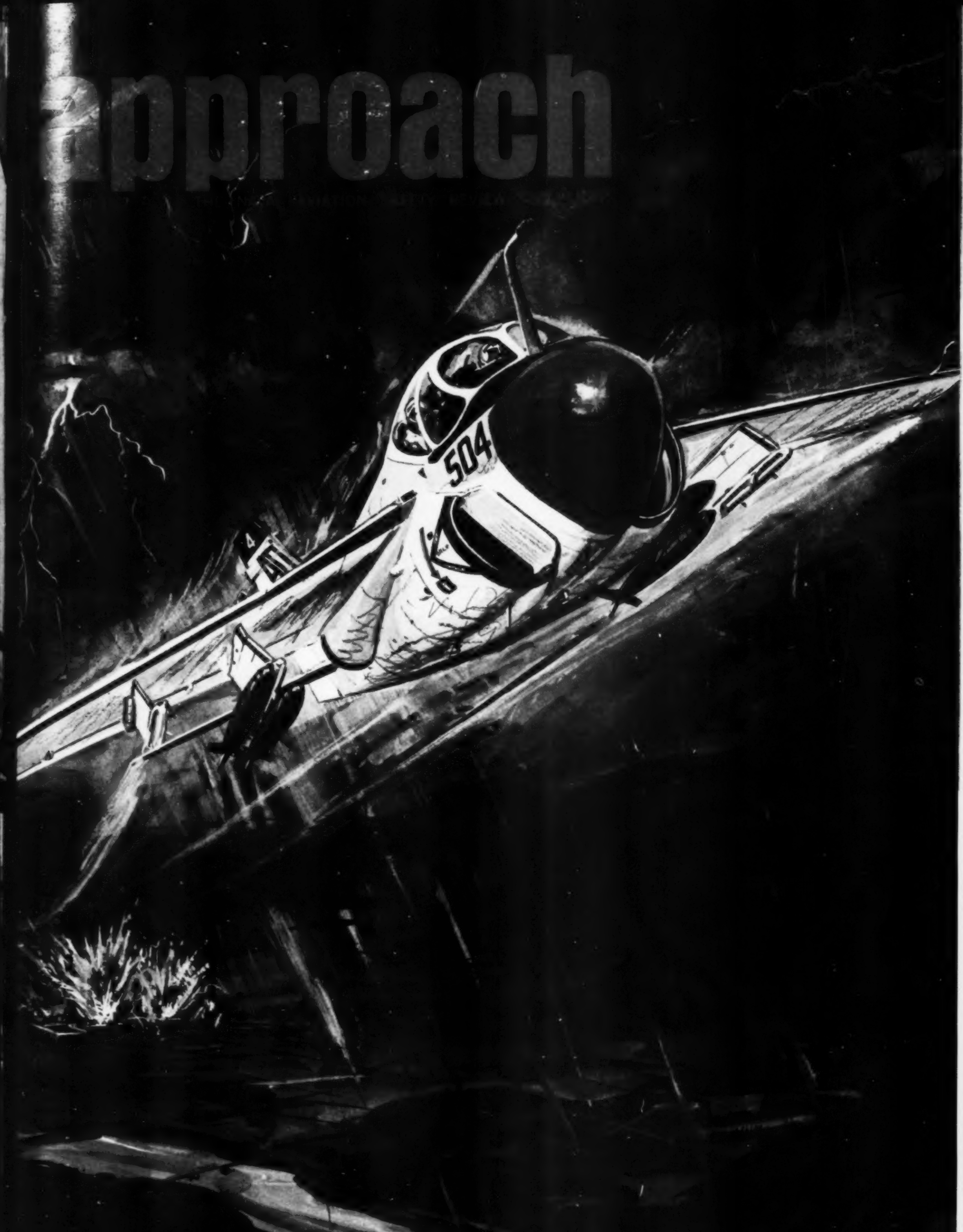

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In Extremis...

Courage, training, and the will to survive—these are the factors paramount in the following narrative of a pilot's survival after he and his bombardier/navigator ejected from an A-6A.

With his left arm disabled, without a raft, and under circumstances which led search and rescue personnel to believe they were looking for only one survivor instead of two, this pilot managed to stay afloat, finally attracted the attention of orbiting aircraft and was rescued.

There was a loud and distinctive explosion in the cockpit. I don't really remember any sensation of pain but I knew that something had gone wrong—I knew we had been hit. I pulled back on the stick to climb out of the area and the next thing I recall is that my bombardier/navigator came up and said, "You're climbing too high." I opened my eyes and sure enough I was climbing a little too high. I grabbed the stick, rolled the plane off to the right, got the nose over to the right, got the nose to go back down and headed for the coastline.

My bombardier/navigator was apparently unaware

at this time that anything was wrong. I kept trying to talk to him on the ICS but I couldn't talk. I tore my oxygen mask off and told him I had been hit. He looked at me and as soon as he realized what had happened, he immediately took charge, so to speak.

Keying the UHF, the bombardier/navigator said, "This is so-and-so. My pilot's been hit. The airplane is still flying. I'll keep you advised." He came right back to me on the ICS and asked, "How do you feel?" I said, "I'm doing fine. I don't feel too hot—there's something wrong. I've been hit but I don't know where."

I realized that the sensation was somewhere in my left arm but I was almost afraid to look down as I was afraid my arm was gone. But I did look down and I saw that my hand was intact. It was just draped over the throttle and I had no use of it at all.

As I've said, my bombardier/navigator sort of took command. He said to go ahead and take a heading of 100-degrees, I believe, and just hang on and let him know how I felt.

As we got out past the coast, I remember being somewhat nauseated and started getting that flushed feeling as if I were going to pass out. I told him, "I'm not feeling very good. I don't think I'm going to get much further," whereupon he produced a bottle of medicinal brandy that he carries for just such an occasion. I tossed that thing down and it cleared my head up right away and I felt a lot better.

I remember I said then, "We've got a problem here. What are we going to do?" I realized, of course, that without the use of my left hand we couldn't land back aboard the ship. However, I considered the possibility that with the two of us flying the airplane—the bombardier/navigator using the stick and me reaching with my right hand across to the throttle —we might be able to land at ——. So I asked him how far it was to —— and he told me. I didn't think I could make it that far as I was beginning to feel pretty bad again. We concurred that the best thing to do was to try to get back to the ship.

The ship was in a southerly direction. If we got there we would be doing real well. If we couldn't make that we still could have gone to —— without going too much further, so we agreed to head out straight for the ship and try to get as close as we could in case we had to eject immediately. The alternative was if we got that far and were still doing well we could proceed on to ——. We flew for what seemed like about two or three minutes, (it probably wasn't that long) when I started feeling a little weak again. I said, "I don't think I'm going to make it to the ship. We better slow down and set ourselves up for an ejection." My bombardier/navigator agreed.

I told him I was

I told him to take the stick and that I would reach over and grab hold of the throttle. He took the stick and held the wings level. I reached over with my right hand, retarded the throttle to about 80% and put the wing tip speed brakes out. I then came back and continued to fly the airplane. As we slowed down, I began to feel weak and nauseated again and realized I couldn't go on too much longer. I didn't want to wait too long to eject as I was afraid of losing consciousness and I was sure that if I did that, I would drown. I definitely wanted to get out of the aircraft with a little bit of consciousness left so that I could set myself up as soon as I was in the water. At the time I still hadn't seen any blood and I didn't know specifically where I was hit, but I was sure I couldn't stay up for a heck of a lot longer.

We got down to about 225 kts and I told my bombardier/navigator I was feeling pretty bad and he'd better stand by for ejection. I asked him if he remembered ejection procedures and he said yes. One thing we should've done but we didn't because of the heat of the moment was to have gone over the ejection procedures together but it didn't occur to us at the time as we were pretty pressed as it was. I told

jettison the canopy.

him I was going to jettison the canopy.

At about 220 kts I gave him the signal that I was going to jettison the canopy. Jettisoning was normal and uneventful. With the onrush of air into the cockpit, I sort of revived again and told the bombardier/navigator that I thought I could hang on for a little bit longer. By this time the wind was screaming in the cockpit and causing a lot of confusion.

We pressed on for another 5 or 10 miles. It couldn't have been much more than a minute or so when I felt myself really slipping. I knew I was on the way out and I yelled over at the bombardier/navigator and said, "I'm going to pass out. Eject!" He looked at me and gave me a thumbs-up and pointed at me. About this time my vision started to spin and the whole cockpit started to spin on me and I knew that I had better get out then or I wasn't going to have a chance.

(Just prior to this I had reached over with my right hand and picked up my left hand and wrapped it around my lap belt and tucked it between my legs so I wouldn't injure my arm on the way out.)

As I said, my vision started to spin. I reached up and grabbed the face curtain with my right hand and gave it a tug. Unfortunately, I don't remember anything else until I got in the water. I think I must have felt my parachute open because some time before I got in the water I inflated my Mk-3C. I sort of remember pulling the CO_2 actuating lanyards in my semi-consciousness on the way down. I came right to the surface as soon as I hit the water and I was immediately revived.

My first concern, of course, was whether my bombardier/navigator had gotten out and I looked around trying to find the aircraft. I saw neither the aircraft nor his chute but I surmised that he must have made it. Either he had gone down a good way from me or he had entered the water about the same time as I had but I just hadn't seen him coming down.

I was very concerned about sharks as we had been briefed about a number of sharks in this area. I think this is everybody's big fear about going down at sea. I was particularly concerned as I knew I was bleeding though I still didn't know where my wound was. My first thought was to get into my life raft. It caused me quite a bit of concern when I reached down between my legs and found that *I didn't have a life raft.*

Some time during ejection, my whole seat pan had left me. I really don't know why. The only thing I can think of was that I hadn't hooked my Harley buckle to my seat belt. I think this is unlikely, however, because whenever I have strapped in without having hooked up, it has been immediately apparent to me that something was wrong. It is just second nature to you—when you strap the seat belt down and the Harley buckle isn't in there, it just doesn't feel right so you fix it.

The other reason I think I didn't forget to buckle it up was that if the seat pan went off, it had to slide off my legs and past my feet, and I'm sure that with the body position I must have been in on ejection, I surely would have had scratch marks on my boots or a bruise someplace. I didn't so I think probably what happened is that my left hand which I had tucked under the lap belt must have pulled up the lap belt when the parachute opened and just released the whole lap belt assembly.

So there I was in the water—bleeding, with no life raft. I looked over and saw my parachute floating about four or five inches below the surface. Contrary to everything we've ever been taught about getting away from your parachute to avoid getting tangled up, in my concern about sharks I thought if I could just get on top of the chute, since it was already under water, and pull it up around me, I could keep the blood contained in the chute itself and it wouldn't attract any sharks. I got over on top the parachute and immediately saw the water turn crimson against the white background. Almost as

soon as I got there I began to get tangled in the shroudlines. It wasn't 10 or 15 sec before I realized that this was a real poor idea. I started swimming away from the parachute and started looking for my shark chaser.

I had been the safety officer in the A-6 RAG and in this particular squadron. I think I know survival equipment in the A-6 and ejection and survival procedures as well as anybody. Nevertheless as many times as I had been through it with two hands, I couldn't for the life of me find my flares or my shark chaser with my one good hand. One hand or two hands makes a big difference in this game. I had a terrible time trying to pull the shark chaser out. Fortunately, after about five minutes of playing around and trying to feel my way around under the Mk-3C, I finally found a bag of shark chaser. I opened it with my teeth and started putting it around me and felt a little more secure.

All this time, by the way, I wasn't the least bit concerned about being rescued because from the time I went in the water until about halfway through the episode, the squadron CO was holding directly over my head at about 1000 ft in a very tight orbit. I knew he had me in sight so I didn't get out my signal devices. I was only concerned about staying alive in the water until the rescue aircraft got there.

I swam away, kicking moderately and thinking if I could let the blood stream out behind me instead of letting it pool around me in one place, I would probably be a lot better off. My whole logic about the sharks and what to do and what not to do down there probably doesn't make much sense, but you just do it instinctively when you're in a situation like this.

About this time two A-1s came over and I saw an Air Force *Albatross*, which they use over there for rescue. I estimate I had been in the water about 15 or 20 min at the time I saw it come up on the horizon. Unfortunately, as the *Albatross* got closer to us, our commanding officer rolled out of his tight orbit around me to give this fellow instructions for my best interest and when he rolled in again, he reassumed his orbit about 3 miles away from me.

What happened was that they had seen me eject and the airplane crash and had heard the B/N talking to them on the air. They assumed that only the bombardier/navigator had gotten out and that I, being injured, had gone down with the airplane. What had, in fact, happened was that we had both gotten out fairly close together but the bombardier/navigator had caught them on their blind side and they never saw him going down. They were only concerned with looking for one person in the water, so they thought. When they rolled out and rolled back up, they acquired the bombardier/navigator not me. They set up the orbit around him, thinking we were one and the same.

All of a sudden, aircraft started coming from every which way. There were A-1s and helicopters and another *Albatross*. I think I counted about 12 airplanes all around me about 3 miles away, and here I was, all by my lonesome, feeling pretty bad about the whole thing. About this time sharks were my second consideration—I had to start thinking about how to let somebody know where I was.

The first thing I looked for was the Mk-13 Mod 0 day/night signal flare. I pulled one out and realized right away that I was going to have a hard time igniting it with only one hand. I thought of trying to do it with my teeth and immediately dismissed that idea. I thought of putting the flare under my dead arm next to the Mk-3C and pulling it with my right hand, but I was afraid to do that for fear it would burn a hole in my life preserver which was the only thing keeping me alive. So finally I decided to put it between my knees under water and pull the cap off, then try and hold it up above the surface. I pulled both ends—the ring on one end just snapped off and the other end peeled off the way it's supposed to but it didn't ignite. I was very disappointed that I couldn't get either end to work. Then I went to my PRC-49 radio which was rigged in a shoulder strap arrangement in a canvas bag that we carry with us on our person. Unfortunately it sits right in front of you at stomach level and it blocks your access to most of the other things in your Mk-3C and your survival bag if you don't have a good arm to push it out of the way to get what you want.

I wrestled with the radio for about 5 min to get it out of the pack and turn it on. I was very disappointed not to hear the beep signal which would have indicated that the radio was working. I went to "transmit" position and tried to call and tell the rescue aircraft that I was in a straight line south of their position and please acknowledge. I didn't hear a thing so I finally gave that up and went to the beeper transmitter position. I tucked my PRC-49 under my right arm trying to hold it on top of the Mk-3C.

About this time, two A-1s came directly over my head, heading for the big group of circling rescue aircraft which was still about 3 miles away. I pulled out my .38 caliber pistol loaded with ball ammunition. (I had thought that if I ever needed it right away, it was going to be in a situation where I had to shoot somebody and that if I ever needed it in a survival situation I would have time to reload with tracers which I also carried.) Even though it

was loaded with ball. not tracer ammo, I thought at least the A-1s could hear me firing. They were about 700 ft and right over my head. When I fired the first four rounds and got no acknowledgement, I was pretty desperate. I damn near took a pot shot at one of the A-1s to get their attention. But I thought, that wouldn't solve any of my problems so I shot off

the last rounds under the A-1's right wing and that didn't do any good either.

I tried to reload with tracer ammunition but found I couldn't do it with one hand, so I set it under my right arm and it immediately fell into the water and I lost it. I had had it tied with nylon lanyard but the lanyard was cut or undone because I lost the pistol.

I had taken my hard hat off prior to this and waved it at the A-1s when they approached me. I knew they couldn't see me so I tied my hard hat to my Mk-3C life preserver but it broke loose and also floated away. *I was slowly losing every bit of survival equipment and signaling equipment I had.*

I wanted to get into my survival vest where I carry some extra flares, a compass and a few other things, but I really had a problem getting all my survival equipment with one arm because of the arrangement of the Mk-3C up around me. I had done this in practice but this was a different situation using one hand because you have to push things out of the way.

Then I decided I had to fire my pencil flare gun. I should have tried this initially, but when I looked down to try to decide what to pull out, it was down underneath a bunch of stuff. I had to unhook the Mk-3C life preserver and dig around and finally I came up with the good old pencil flare gun. I screwed it onto the first cartridge and waited until the two airplanes which had just been overhead turned. When they were headed right for me, I fired a flare off and they leveled their wings and proceeded to me. When they arrived I fired another flare. By the time I got the third in the gun, a helicopter was approaching. I fired the flare and he had me in sight and was hovering overhead in a matter of minutes.

I had, as I said, lost my hard hat and was very disappointed to find I couldn't watch the helicopter because of the spray kicking up. Without something protecting your eyes, you just can't look at the helo. I looked up to see what he was going to lower—either a horse collar or a pronged seat. I thought, "If he lowers the seat, I can probably get myself up with one hand, but I don't think I can hook myself up with a horse collar."

The first thing I saw coming down was a horse collar. I remember looking at the helo behind me—I had to keep my face away from the rotor wash. My bombardier/navigator, who had already been picked up, apparently told the helo crewman to hook him up and he came down into the water (after being rescued himself!) and hooked me up by my torso harness. They hauled me up into the helo and then lowered the horse collar again to pick up my bombardier/navigator. He waved them away and was hoisted by another helicopter. We were both taken to the cruiser where our wounds were treated and the next day I got back to the ship.

As far as the survival equipment is concerned, I was very disappointed in the fact that my radio didn't work and I asked the people who were on the scene if they heard a beeper. They apparently heard my bombardier/navigator transmitting from his raft—he actually talked with them—but my radio didn't work at all. The pencil flare gun is worth its weight in gold as far as I'm concerned and I'm going to carry about twice as many cartridges as I ever carried before.

Set it Right the First Time

By LCDR Gerald W. McDonald,

NATOPS Instructor, VP-26

A recent incident report submitted by a P-3 squadron points out the fact that pilots do not read what they see or see what they read. This particular incident, although it has happened in P-3 aircraft on two known occasions, may occur in any aircraft that utilizes a pressure altimeter.

As background, let us recall the first hairy occasion as related by the pilots involved. (Both pilots were exceptionally well qualified instructors in a replacement squadron—it can happen to anyone.)

On this day the big blue bird returned from a morning training flight with a minor discrepancy in the altimeter setting for both the pilot's and the copilot's altimeters. This discrepancy was left for night check to work off—but—in the interim period between landing and the work actually being performed, a large barometric pressure change occured at the field when a low pressure area moved in. This low pressure resulted in the static altitude reading of the altimeter indicating approximately 500 ft above the field elevation.

The steps in the correction of the error start off with inserting the altimeter setting so the altimeter reads the correct field elevation. The electrician correcting the gripe turned the altimeter setting so that the gage read exactly 1000 ft above the field. The next step is to disconnect the altimeter setting control from the altimeter indicator with a screwdriver and then rotate the altimeter setting to the correct value, which was obtained by radio from the tower. This step does not cause the altitude reading to move from the field elevation so now the altimeter read 1000 ft above the field but the altimeter setting now read correctly. With this done the altimeter control was reconnected and our patsies were all set up for the big game of "dodge 'em in the clouds." Enter the unsuspecting aviators about to start off on a cross country training flight.

"Engines started, call ground control and have them start working on our clearance. My altimeter's set and I have a zero correction, night check did a good job this time. Sure hope there isn't much traffic in this bad weather, any delay will cut into our enroute time."

"ATC clears Navy 782 to the Freedom airport via Victor 1 maintain FL 220. Right turn after takeoff climb via the Funston One Departure. Contact Go-Go departure on 276.4 Mode 3 Code 2100. Read back."

"Max Power."

"There goes 18,000 ft set 29.92 in your altimeter. This bird really climbs to get up here this fast. It must sense the Old Pro at the controls."

"We're on our way at 220. Wonder how high the tops of these clouds are?"

"We're beginning to break out now. Look out

there's a stupid 707 right on our altitude! Check your altimeter, mine says 220 right on."

"Discotheque Center this is Navy 782 do you have an Eastwestern 707 in my vicinity?"

"I don't care what he says that guy is not at FL 240. Oh well, we are above all the clouds now and do not have to worry about another one of those guys passing us without being able to see him."

"Navy 782 you are cleared for a VOR I approach straight in to runway Seven. The weather is 1700 overcast, visibility four miles in haze, altimeter 3004. Report commencing."

"Joe did you see that TV antenna we just went by? The approach plate says that it is 1000 ft high but I'd swear that it looked like it was above us, and I'm showing 1600 ft. How about checking his altimeter setting. I didn't think that the terrain around here was that high."

"Give me the after landing checklist, and have you noticed that both of our altimeters show 1000 ft higher than the field elevation? Wonder how that happened?"

Hairy Tale Two

A second very similar experience recently occurred in another P-3 squadron. It was not quite as hairy a tale but the following information from the report of the incident makes for good reading:

The cause of this incident is presently undetermined. Prior to the flight, maintenance personnel adjusted all three altimeters. (This time they got to the navigator's just in case he might look and warn someone prior to the takeoff.) Pressure altimeters were checked and set prior to the takeoff. A current altimeter was obtained from a surface unit in the operating area. While on station, a descent to 500 ft above the water was made for the purpose of cross checking radar and pressure altimeters. This normal precautionary procedure revealed no discrepancies. (Sounds like twice on this flight they were misread.) No unusual fluctuation of pressure altitude indication was noticed upon climbout after departing station or enroute to the home field. No icing conditions were encountered during the flight. During a meticulous postflight investigation the current field altimeter setting was used and all three pressure altimeters read 1000 ft *too high*. Careful checks of the pitot static systems revealed no foreign object interference or other discernable discrepancy. Pressure altimeters were adjusted in order to read properly and a flight test was conducted. The pitot static system functioned normally during this test flight. It is highly improbable that human error caused this incident. The altimeter setting provided by the tower had been confirmed as correct. The possibility that the pilots erred in setting altimeters is eliminated by the fact that all altimeters read 1000 ft high, with the proper setting, during the postflight investigation. The possibility of maintenance personnel having erroneously adjusted altimeters prior to the flight is greatly reduced by the fact that the altimeters were checked by the pilots twice; prior to takeoff and while on station. It is significant to note that three separate indicators which are part of two separate systems all were in error.

To quote a current cliche, "Would you believe just a little human error?" The significance of the last sentence is that the errors were exactly the same in both pitot static systems. The laws of probability and chance are too great for one to believe this problem was anything other than maintenance induced and flight crew actuated.

It Could Happen to Anyone

Even the fledgling aviator can remember a time or two when he has misread his altimeter and then later realized it (maybe during a panicked thought). But misreading it on the ground prior to takeoff, who would ever believe that possible. It is; just try having the altimeter mis-set by exactly 1000 ft while the altimeter setting reads correctly and you will find that more than 99 out of 100 will not catch it.

There is more than one way for the sterling naval aviator to prevent having this trap sprung on him, but long ago an aircontrolman related to me the best method that has been presented to date.

Since almost all naval air stations are located close to the water, even the floating kind, then the field elevation cannot be too much above sea-level, and the following habit pattern will save you from being caught:

1. Walk or climb into your airplane (P-2 drivers will have to crawl).
2. Sit down and strap yourself in.
3. Set the altimeter to read *ZERO* feet and count all three of those little needles pointing at each other.
4. Set the altimeter to read field elevation.
5. When you receive the altimeter setting, compare it with what yours reads, note the error and remember to apply that error to all subsequent settings.

The time necessary to set your altimeters in this manner is usually less than five seconds. Maintenance personnel are also authorized to use this procedure, only they may eliminate the strapping in.

For multipiloted aircraft it might also be advisable for the maintenance department not to authorize adjustment or change of both indicators between flights of the same aircraft, or the next one might not be just an incident but rather an unexplainable accident.

Pride and Prejudice in

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...in Landings

By COL J. H. Reinburg USMCR

The basic law on the earth generally accepted by all is "what goes up must also come down." Our space program has successfully defied this axiom by putting sufficient power in rockets to thrust them beyond the earth's gravitational pull. However, the axiom still holds true for us garden variety type aviators who fly air breathing and air lifted machines.

In primary training, teaching pilots to land safely encompasses some 50 percent of the program. As pilots graduate into different, more complex and faster aircraft, landing practice is still a major effort. About the time a naval aviator thinks he has mastered this return-to-earth requirement, he must take on the added peculiarities of the carrier landing.

Nonflyers have been heard to say, "what's so hard about landing an airplane? You just aim for the runway and stop the engine when you feel the wheels touch." This statement is just about true for some well designed light planes that touch down in the 30 to 40 mph speed realm. Their problems are further simplified by little payload variation. The fast military models, however, have compounded problems.

Getting combat military airplanes back on the deck safely has become an increasingly difficult problem

The problems of safe landings have risen in almost direct proportion to touchdown velocity.

in part, owing to their higher speeds. History has consistently proven that an aircraft's maximum speed is the main key to its survival in a combat environment. Design restrictions are such that landing speeds are directly related to maximum flying speeds. So, if we are to have the fastest aircraft in the air today, we must learn to live with high rate touchdown speeds, at least until some other revolutionary development becomes operational.

The problems in safe landings have risen in almost direct proportion to touchdown velocity. Coincidently, tires and landing gear must be strengthened (and made somewhat heavier) to work satisfactorily upon initial touchdown on the duty or a CVA deck. Auxiliary lift devices like flaps, slats, boundary layer control, etc., have given only marginal assistance in reducing speeds by up to ten percent on the average.

Alternate Landing Methods

Some very interesting ideas have been suggested from time to time which could eliminate (or lighten) landing gear and their associated problems. One that looks very good at first glance, is an air cushioned deck. Such a system would eliminate landing gear but would require some extra strength (and weight) on the underside of the airplane. The real barrier to this program is how do you recover, respot, and service the large numbers of airplanes required to win wars?

Another system which works is to have a hook on top of the airplane so it can decelerate after catching a suspended trolley device sliding on a cable. Unfortunately, the hook adds drag and weight while the mass ground handling problem is a major barrier like the cushion deck. Moreover, speeds over 60 kts compound the problems. Seaplanes could be one easy solution but corrosion, attendant water damage and handling problems are formidable. Not to mention the seaplane tender requirements and other numerous small craft necessary for support. Moreover, man is a creature of the land so that to use seaplanes in quantity requires a foreign combination of land and sea facilities not always available where the military action is.

When and if operationally developed, VTOL aircraft may show great promise for vastly reducing present landing problems. But new problems will be created such as the vexing ground impingment difficulties. Additional weight and complication of necessary VTOL machinery will also measurably reduce payload and range.

By the middle 1930s, stall and spin problems of aircraft were well understood and experienced pilots seldom let this be a part of their landing problems. The advent of tricycle landing gear eliminated most of the roll-out landing difficulties. Retractable landing gear which was introduced in quantity during this time period, created pilot error problems that have since been a constant source of embarrassment. In short, to be a competent pilot in today's combat aircraft, one must make it a full time occupation.

The Real Landing Problem(s)?

In order to get a combat airplane back on earth in one piece, a pilot must do many things some of which are: slow to approach speed at a designated altitude; have sufficient fuel source selected (or sequence); work the radio; be at required speeds and specific angles of attack for, lowering the gear, the flaps, the slats, wing angle of incidence change, wing sweep position (some planes have more gadgets than others); vary trim with changes in weight, approach speeds and external protuberences; lower the hook (for carriers and field arrestments); touch down on the first part of the runway (or deck); apply thrust reversers (when installed); use the brakes diligently; release the parabrake (when installed). After all of this grunting and groaning, the plane must be taxied and parked (and this is not always easy on a congested airport), because you (the pilot) are not finished until all is secured. Many a tire has been blown and wing tip bent on the taxiway.

Every few months, another hot fighter is crunched by a combination of poor landing technique, wet runway and too late dropping of the hook. This tail hook idea has been a highly refined piece of hardware in use by the Navy for many years. So good in fact, that the Air Force is now making it standard equipment on their first line fighters.

An Unusual Landing Incident

An F-4 aircraft has most of the required devices to make it go faster and land slower. A recent accident had all of the devices working but the main one, the pilot. Upon approaching an 8000 ft wet runway,

At 140 kts the F-4s tail hook engaged the chain gear and all hell broke loose. . .

. . . The *Phantom II* came to a halt on its nose in the dirt.

the pilot decided to take a voluntary waveoff and requested to take the Morest gear. The second approach was waved off by the tower because the Morest was not quite ready. The third approach resulted in a normal field optical landing with acceptable speed control. The pilot said he did not deploy the drag chute in case he missed the Morest (located 4200 ft from the touchdown end of the runway) and had to take another waveoff. And miss the Morest he did. The pilot said he let the hook go approximately 500 ft from the pendant. The Morest crew said it came down too late to catch the second and last pendant.

When it became evident that he had definitely missed the Morest, the pilot informed the tower that he was going around again for another try. As he was applying power, the tower operator twice informed the pilot that his tail hook was still down, but the message was not heard or comprehended by the F-4 crew. At about 140 kts with the nose wheel off the runway, the F-4's tail hook engaged the field emergency arresting gear (E-5 Mod-1 otherwise known as the chain gear) and, as you can imagine, all hell (and parts too) broke loose. The big chain whipped and snapped slinging nine links as much as 4500 ft. The missiles injured one bystander, another airplane and a car. The *Phantom II* came to an unghostlike halt on its nose, in the dirt. A shaking but otherwise unscathed crew emerged unhurt.

NATOPS instructions for the F-4 landing on a wet runway states: "A wet runway landing should be made at a normal landing gross weight of 31,000 lbs. (this F-4 was estimated to gross out at 35,000 on the first waveoff). Fly a normal approach with an 'on-speed' or slightly lower indexer indication. The drag chute should be deployed on touchdown and the flaps should be left in the DOWN position. To further decrease thrust it is recommended that the left engine be shut down. Light braking can be initiated at 100 kts CAS. Be prepared to engage the arresting gear if the aircraft is not slowing down properly. *Lower the tail hook at least 1000 ft ahead of the wires;* five seconds are required for full extension."

Obviously, the pilot received all the blame in this accident.

Continued

Once the aircraft was on the runway , the pilot used improper procedures by applying brakes at a speed far in excess of the 90 kts recommended by NATOPS.

Cockpit Preoccupation

No two runway overshoot incidents/accidents are exactly alike. One worth mentioning, however, happened to a pilot flying an F-8. Everything was properly accomplished as the pilot turned toward the runway from the 90-degree position. A moment later, the roll stabilization system was felt to go off and the associated warning light came ON. The pilot shifted his attention to inside the cockpit and cycled the roll stabilizer switch which then stayed out. Next, the pilot turned his eyes back to the runway and immediately became alarmed by an excessive sink rate. Full military power got things back to a somewhat normal but flat approach. The abnormal burst of power in a wing-down condition (the wing had dropped on the approach but the pilot failed to realize it) caused the plane to float 1000 ft past the approach end of the runway where it was forced on the pavement at an estimated 150-160 kts. Shortly after the wheels were rolling, the pilot informed the tower operator that the landing would be to a full stop (the pilot had originally planned a second touch-and-go landing) because of roll-stab difficulties. Braking was commenced soon after touchdown and both tires blew between the 3000 and 4000 ft markers. The hook was dropped just in time to miss the emergency arresting gear. Realizing things were not going too well, the pilot did some fast thinking and radioed for crash trucks while shutting down the engine. A cliff beyond the end of the runway further motivated the pilot to keep busy, so he applied left full rudder causing the *Crusader* to swerve as desired. After collapsing the port main mount, the plane came to rest short of the cliff 400 ft off the left side end of the runway, in a wing DOWN but not locked configuration. The pilot was uninjured.

It was concluded that this accident occurred because; "—The pilot did not analyze his emergency (untimely and inadvertent lowering of the variable incidence wing in the final stages of the landing approach) correctly, although his initial corrective action was proper, in that he recovered without striking

The *Crusader* came to rest short of a cliff.

An AF-9J recently joined the pack.

the ground short of the runway.

The proper response when the aircraft accelerated from about 135 kts to over 160 kts as it approached the end of the runway, would have been to wave off. Once the aircraft was on the runway, the pilot used improper procedures by applying brakes at a speed far in excess of the 90 kts recommended by NATOPS. Once the pilot was on the deck and realized his speed was excessive, he should have secured his engine and dropped the tail hook immediately."

As to why the wing incidence mechanism returned to the DOWN position, the board concluded; . . . "It was possible for the pilot to inadvertently depress the solenoid button and dislodge the wing incidence control handle from its detent with one motion of his elbow while cycling the roll stabilization switch" . . . F-8 pilots take note.

High and Fast

An AF-9J recently joined the pack with this run-of-the-mill landing overshoot. The pilot entered the groove high and fast, and the RDO radioed to him to "start it down." It would appear in retrospect that the message should have been *a mandatory waveoff* but—the pilot pressed-on, making a fast touchdown about 1000 ft down the right side of the runway. An attempt to use aerodynamic braking only succeeded in getting the jet back into the air.

By the time the second return to earth occurred, the pilot had applied full throttle for the waveoff and 300 ft down the duty with the engine still accelerating, the port tire blew. This turn of events now reversed the takeoff plan. The pilot immediately shut down the engine and started lowering the hook—yep, you guessed it—, just in time to miss the abort gear. However, the barrier gear grabbed him and prevented a total washout.

The recommendations were: "Aerodynamic braking should not be commenced while aircraft still has flying speed. Once a waveoff has been initiated, a subsequent abort should be avoided if it is possible to get airborne safely. In executing an abort, where engagement of the abort or barrier gear is anticipated, the importance of securing the engine and lowering the hook as rapidly as possible should be reemphasized. The importance of engaging MA-1A barrier gear on or near centerline going straight should be reemphasized."

The Message

We could go on and on citing cases of landing incidents/accidents. However, the message is quite clear. Every braking and stopping device must be used to maximum efficiency. All but one of these devices are mechanical with fixed capabilities. The one exception is the pilot. Besides having full knowledge about all of the mechanical gadgets, he must utilize proper speed control for his particular airplane.

Even the best of pilots occasionally miscalculate and make a high and fast approach but these fellows stay among the smart ones by knowing when to swallow pride and take a voluntary waveoff *before* passing over the approach end of the runway. Moreover, these pilots are hook artists; they drop it plenty early.

Short Snorts

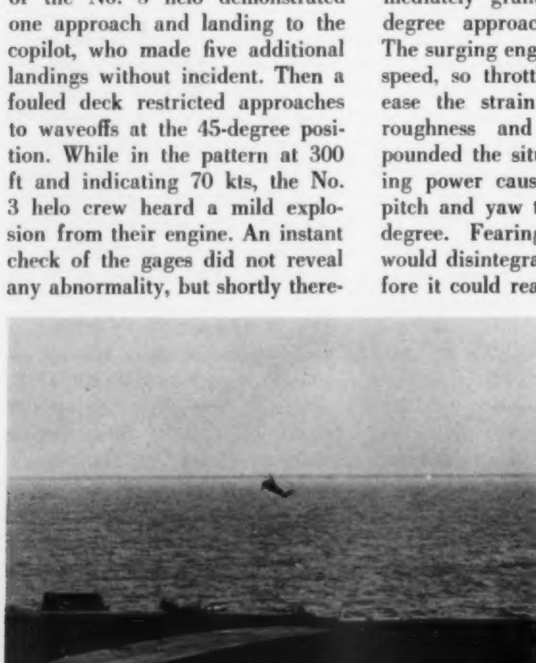
The Complete Dilbert Dunker

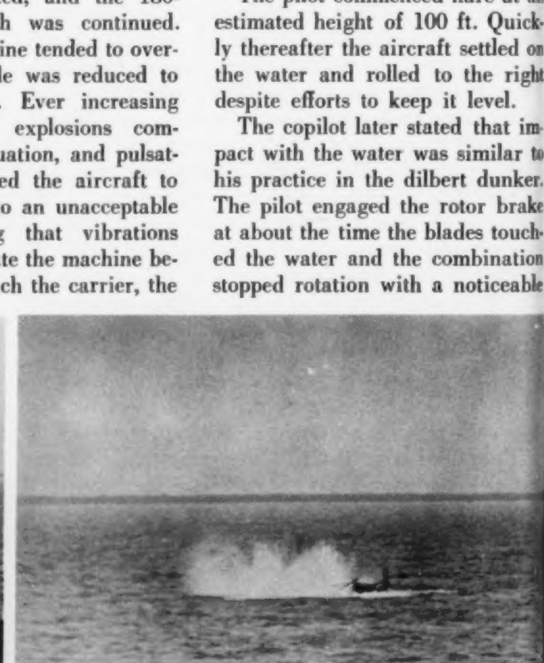
A flight of five H-34 helicopters were conducting carquals. Before takeoff, the crews had been thoroughly briefed on the proper pattern, emergency procedures and other pertinent data. The pilot of the No. 3 helo demonstrated one approach and landing to the copilot, who made five additional landings without incident. Then a fouled deck restricted approaches to waveoffs at the 45-degree position. While in the pattern at 300 ft and indicating 70 kts, the No. 3 helo crew heard a mild explosion from their engine. An instant check of the gages did not reveal any abnormality, but shortly thereafter roughness was felt in the engine and indicated by the instruments.

With an obvious emergency at hand, the pilot resumed control and informed the ship of his trouble. Clearance to land on a cleared part of the deck was immediately granted, and the 180-degree approach was continued. The surging engine tended to overspeed, so throttle was reduced to ease the strain. Ever increasing roughness and explosions compounded the situation, and pulsating power caused the aircraft to pitch and yaw to an unacceptable degree. Fearing that vibrations would disintegrate the machine before it could reach the carrier, the pilot abandoned his plan to land aboard the ship and prepared to ditch the helicopter. Descent was at 55 kts indicated. At 150 ft, the wheezing engine once again surged to 2700 rpm, then as it reduced, the pilot secured the ailing power plant.

The pilot commenced flare at an estimated height of 100 ft. Quickly thereafter the aircraft settled on the water and rolled to the right despite efforts to keep it level.

The copilot later stated that impact with the water was similar to his practice in the dilbert dunker. The pilot engaged the rotor brake at about the time the blades touched the water and the combination stopped rotation with a noticeable





thump. The crew emerged, unhurt, and they were quickly picked up by a safety boat nearby.

Thorough briefings and sound procedures do pay off.

Wrong Handle Again

A pilot taxied a T-33B away from the line toward the runway takeoff position. The canopy was in the "full open" position. The pilot reached down the right side of his seat, intending to retrieve the automatic lap belt ground safety assembly (pin). As he did so, an explosion was heard and the canopy dropped onto the cockpit sill. Investigation disclosed that the forward canopy ejection handle had been actuated inadvertently.

This type of incident has occurred so often that the NATOPS flight manual for the T-33 carries this warning on page 1-42. "*Caution*: The modified T-handle on the later aircraft applies a large amount of force to the initiator sear for a small amount of force at the handle. About 14 lbs force at the handle imparts 25 lbs of force to the initiator sear. Consequently, the handle location and the relatively light pull required to discharge the initiator makes it possible for the canopy to be jettisoned inadvertently by fouling on the safety pin streamers when removing the safety pin or by fouling on the occupant's personal gear."

Weather at its Worst

Except for knowing that it is brrr—, cold-extremely cold, most individuals have given little thought to the other weather problems in Antarctica. People have been heard to say that icing is not a problem in this geographical area because the ambient air is always too cold for ice to form on any part of an airplane in flight. Don't you believe it.

We all know how the glare of snow in the sunlight hurts the eyes and reduces vision—some people call it snow blindness. On overcast days in Antarctica (and in the north pole area also), a similar phenomenon occurs when clouds blend in with the surface snow (which is almost always present) and create a situation commonly called a "white out." This is a lot like a clear but moonless night in which there is no horizon; the sky and the land (or sea) blend together.

A combination of aircraft icing and pilot "white out" caused a tragic accident in Antarctica. An LC-47J picked up enough ice on the leading edges of its wings, tail and propellers to cause it to stall at a higher than normal airspeed. It is possible that airspeed indications were erroneous because of icing, but when combined with aerodynamic changes to the airplane and the confusion of a "white out," the crew was headed for trouble.

This new crew was well briefed on the problems peculiar to polar flying, but nevertheless the accident happened.

Enroute to their polar destination in their ski-equipped *Skytrain*, stratus clouds were encountered which formed ice on the plane as forecast, because the temperature was a warm (for Antarctica) +20°F. However, this was not considered to be a problem since the airplane had good de-icing equipment.

A similar LC-47 had preceded this flight by two hours and had reported icing conditions. Their de-icing equipment had worked as advertised and the ice was properly removed from the aircraft. This information was relayed to the aircraft which was still airborne. Unfortunately, it did not appear to concern this crew because there is no evidence of their having operated any de-icing equipment.

On approaching their destination, the crew was given a report of prevailing weather conditions as they had been observed by the pilot of another aircraft. When first sighted, the doomed airplane was making a straight-in approach from about ten miles out. (Normal squadron procedure had been to circle the landing area once to get a first hand look at everything.) With the gear down and in a descent through 200 ft above the snow, the right wing dropped suddenly to about a 50-degree bank, and the plane commenced a turn to starboard. A few seconds later, the plane was observed to regain level flight momentarily. It then assumed a nose-high attitude, and whipped over to port in a near vertical bank as the nose fell through. Almost immediately, the left wing contacted the ground. Fuselage impact followed quickly, and the entire forward half of the aircraft instantly disintegrated. There were no survivors.

Many pilots have and/or will encounter ice from time to time, but only a few will run into a combination of ice and "white out." This tragic story is only related to remind others who might chance onto such a severe weather combination, that allowances must be made for the added weight and changed aerodynamic characteristics of aircraft that encounter structural icing. A "white out" makes a seat-of-the-pants landing most difficult, especially if the airspeed indicator is incorrect because of ice blockage. Remember: *prepare the aircraft in advance for anticipated icing conditions prior to entering them*. In addition, mentally prepare yourself and the crew.

Everybody's Still Doing It!

By CDR M.J. Travers

During recent years, development of single-piloted aircraft have forced the evolution of some important principles in training pilots. These could be more or less expressed in this manner: Simplify; standardize; improve on standardization; *simplify*. Most especially in the field of instrument flight instruction, *simplify* has had to become the watchword. The fast plane by itself becomes a tiger for the pilot to hold by the tail, and complicated procedures, *when not necessary*, are just that—not necessary.

But back in the realm of airways flying, everybody's still doing it. Yes—well, most everybody still wants to unsimplify. Just two good examples are enough for this short paper:

Your buddies in the air are still confusing themselves by complicated holding pattern entries.

And they are taking up your radio prime time by airborne verbatim readbacks.

First, the holding pattern entry. There are numerous ways of entering a holding pattern, be it tacan low freq, or VOR. Yes, many ways to comply with what's set forth in Flip Part II. But the best way to keep that one-pilot jet in the right airspace on a pilot-confusing stormy night is:

(a) Turn at the holding fix in the shortest direction to the outbound heading—hold for one or one-and-a-half minutes or until the DME says, and then turn in the shortest direction inbound to the fix.

(b) Either track in or home directly back to the fix.

(c) The diagram in Flip II says in addition to favor the holding side with your first turn if you're within 70° of your inbound. (See Fig. 1.)

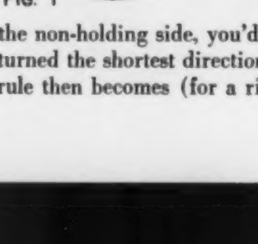


FIG. 1

We can even simplify this exceedingly simple procedure. Instead of trying to figure whether you're within 70° on the holding side or non-holding side of the inbound bearing or radial, just figure 70°, *period*. Figure 2 shows that if you're on the non-holding side, you'd turn the right way if you turned the shortest direction outbound. The simplified rule then becomes (for a right-hand pattern):

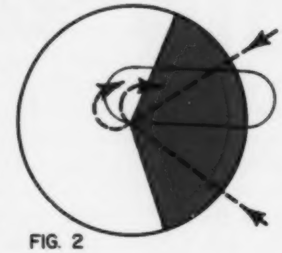


FIG. 2

(a) and (b) If approaching the fix, turn in the shortest direction, etc, etc.

(c) If within 70° of the inbound heading, turn *right* to the outbound heading.

There is one more simplification that the vertigo-nudging pilot should always adopt. If you're confused, forget the 70° limitation and just (a) and (b) turn outbound in the shortest direction, *period*. If you've done your duty and slowed down three minutes before the fix, or if you're a slow aircraft, you can feel confident that you won't violate any airspace.

Number two confusion maker is the pilot who always reads back, verbatim, all in-flight clearances. The rules require reading back only heading and altitude when on a GCA, and altimeter whenever received. All other transmissions except those of a request nature, can be acknowledged by "Roger Out." Of course if you don't understand, by all means ask. You people fairly new out of the training command were often taught to read back inflight clearances but this was a training procedure only. So let's do away with a lot of "98947 roger out" type of transmitting. Some weathery flight you may want that prime air time to be fairly empty for your puckered emergency broadcast.

The above considerations are getting a little obsolete in the States what with positive control and all the radar. (You can still refrain from saying: "98947 roger squawking mode 3 code 61"—just say: "98947 roger.") But more and more of our aircraft are leaving CONUS and find that traffic control overseas is generally not as efficient as in the States. You will have low freq Rbns and have little radar control. So let's get back to those good habits the instrument RAGs used to teach you.

Along with all those old axioms, such as "Time to spare? Go by air" etc., let's add three more:

When in doubt, turn out.

Verbatim is verboten.

When you fly, *simplify!*

DEAD RECKONING

By COL J.H. Reinburg, USMCR

Is Dead Reckoning Navigation a Lost Art? There are often several ways to cross-check suspected bad navigational instruments. Learn and understand them.

Several years ago the airline industry was mulling over the amount of time that pilots should fly in any 24-hour period. Eight hours seemed to be the magic airborne figure limit regardless of the fact that the pilot and copilot would divide the actual time at the controls.

Under the press of national defense requirements, combat pilots have no limit to flight time in any 24-hour period. They are often required to press-on until the job is done. However, when excessive pilot time might contribute to an aircraft accident, the mission should be closely scrutinized.

A recent loss of an EA-1F aircraft is a perfect example of a secondary mission ending in failure mostly because of pilot fatigue. Someone in the chain of command must be ever watchful for situations causing mission failure and/or aircraft loss. The first man in the chain is the pilot. However, no pilot

wants to throw in the towel of his own volition for fear of what others might think, or, perhaps, just personal pride. So the next ranking responsible person is the most logical one to say "go" or "no go."

Well, since the pilot survived, let us hear the story in his own words.

"The morning (before the flight) I finally got to sleep around 0100. I had gone to bed at 2330 but had been unable to sleep. I was up again at 0515. At this time I dressed and went down to the squadron spaces. I was assured that the aircraft was in an UP status and that we would make the launch. I then went to operations to check the weather and to contact the COD pilots with whom I would be flying from Pt Duda to the carrier. The flight was briefed . . . and we departed Pt Duda at 0730 for Pt Noa. We arrived at 1130, refueled and stayed on deck an hour, during which time we ate some C-Rations. We departed Pt Noa at 1235 for the carrier and landed aboard at 1413.

"After lunch aboard, I called Air Ops and requested they file me with two CODs for the return flight to Pt Duda. I saw one of the COD pilots before departure and informed him that I would be flying back with them.

"We departed the carrier at 1630. The cat shot was slightly nose down, due possibly to an estimated rudder trim setting necessitated by an inoperative rudder trim indicator. I climbed on course behind Rocking 6, checking my G-2 compass against the wet compass. Playhouse (carrier radio) gave us a heading and an IFF check. G-2, wet compass and IFF checked satisfactorily. I noted this because I set the compass card to the wet compass while on deck and I wanted a second check airborne. I was satisfied the IFF was good. The compass appeared to track properly, and I also had a good tacan lock-on with Playhouse. I then pulled ahead of Rocking 6 to catch up with Rocking 3. I was heading 130° vice 150°, the heading Playhouse gave Rocking 6. Playhouse informed me I was tracking 130°. I joined Rocking 3, and flew a starboard wing position on him until we reached 102 miles south of Playhouse. At this time I took a heading of 105° and observed the COD turning the same. Rocking 6 called and asked if I was proceeding to Pt Duda in company with them. I replied that I was and that I intended to fly about 20 miles ahead and maintain radio contact. He acknowledged, and I maintained my course, 105° magnetic, and engaged the autopilot. I had a known island visually to my left about 50 miles or so. I arrived over the next island check on schedule, and all navigation instruments and indications checked satisfactorily. At this point, I expected to arrive at Pt Duda about 2100, which would make the flight four and one-half hours.

"Around 1915, my (side-by-side front seat) crewman requested permission to operate the radar. I granted the request in order to utilize the radar for possible thunderstorm avoidance after nightfall and in making a landfall. Shortly after this I made a satisfactory radio check with Rocking 6. At this point, *having been airborne for about 8.7 hours, I was very tired. I almost fell asleep several times.*

"Sometime after 1930 I noticed a difference between the G-2 and wet compass indications of about 30 to 40°. Suspecting that the radar scope was causing wet compass deviation, I extended the scope to the viewing position which induced large wet compass oscillations. Having previously experienced wet compass deviation caused by the radar, I ordered the radar secured for another compass check. The wet compass still appeared to be erratic so I elected to continue navigating by the G-2.

"I then attempted, unsuccessfully, a radio check with Rocking 6. At approximately 2020 I succeeded in contacting Pt X GCI and requested an IFF check to establish my position. I gave them an estimated position of 270°, 170 miles from Pt Duda. I squawked the IFF to emergency and requested a steer to Pt Duda. I received no reply and was unable to make further radio contact with Pt X.

"I had tried (to receive) several tacan stations, none of which I could pick up. I had also attempted, without success, to tune in several low frequency stations.

"I continued on a heading of 105° and directed the crewman to turn on the radar and look for land. I knew my fuel was getting low, so I wanted to find land as soon as possible. I switched to Guard Frequency and confessed; asking for any aircraft to join on me. I gave several short counts with a good side tone on the UHF and thinking I was well within UHF range of several stations, I suspected UHF or transmitter failure. We then used the survival radio to transmit; also without results.

"At this point I got a tacan lock-on with Pt X. 030° at 174 miles, but lost it at 171 miles. Shortly afterward, we saw lights and I took up a heading for them. Upon arriving in the area of the lights I did not see anything that was familiar to me. The crewman had been unable to find land on the radar, but he seemed familiar with the area where we made a landfall. From his impressions and the brief tacan lock-on with Pt X, I determined that we were well to the south of Pt Duda and that our remaining fuel

was not sufficient to make it back. I then decided to make a controlled ditching before the fuel was completely exhausted. I informed the crew of my intentions to ditch and briefed them thoroughly on ditching procedures. During this time I continued to squawk emergency and made several emergency transmissions on Guard, all without results.

"I put the canteens, maps and flashlight in my hardhat bag for use later. We could not find the first-aid kit. I then jettisoned the external stores, but the starboard pod would not release.

"I picked out three fishing vessels which formed a good landing reference line. By the light of the moon and those of the fishing vessels, I was able to see the surface of the water fairly well. I told the rear seat aircrewman that I would inform him as we descended through 1000 ft so he could jettison the rear canopy. I made my approach with 250 pounds of fuel remaining. The fuel gage is unreliable at indications below 200 pounds. I informed the crew upon commencing my final approach . . . to jettison the canopy. There was a jolt when the canopy separated, as though it had struck some part of the tail surfaces. I informed the crew that water entry was imminent, felt the hook hit the water and decreased my airspeed from 100 to 95 kts, flaps DOWN, gear UP.

"We hit wings level and spun to port. I then disconnected my radio cords and lap belt and jumped onto the wing. The front seat crewman was already out, although he had hit his canopy handle and become stuck for a second. I checked the rear seat and the rear crewmen were out. I returned to the front cockpit and got my parachute, hardhat bag and seat cushion. I walked down the wing, pulled the toggles on my Mk-3C and stepped into the water. The life vest functioned perfectly and I floated comfortably.

"The aircraft was still afloat but was beginning to sink, nose down. I then called to the crew, whom I could see in the water . . .

"I would estimate that we had been in the water about 15 minutes when we were picked up by fishermen and taken to a village on a nearby island.

"*My total flying time for that day was 11.2 hours* and I was extremely fatigued at the end of the final flight. The crew was calm and professional throughout the emergency, and this contributed greatly to our safety.

"This accident could have been prevented had I remained in company with the COD aircraft. My reason for proceeding independently was that I was quite tired and did not feel up to the effort of flying a wing position for a four-and-a-half-hour flight. I had made the flight several times previously and was confident of my ability to reach Pt Duda safely."

The accident board had these conclusions:

"The primary cause of this accident was pilot error. The pilot erred in leaving the accompanying aircraft; in failing for an appreciable time to cross-check his compasses; and in electing to utilize the less reliable of differing navigational indicators. Contributing causes were: extreme fatigue, caused by sleep deprivation and extended flight under strenuous circumstances; malfunction or failure, cause unknown, of both the G-2 compass system and the AN/ARN-6 direction finder, the proper functioning of either of which would have prevented the accident."

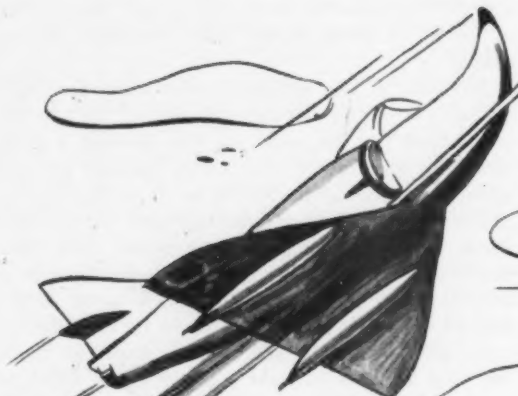
Nowhere in the accident report were the flight altitudes mentioned. In the early part of the trip, the pilot stated that he could see and identify a large island 50 miles away. This would indicate that the plane was at least about 5000 ft up. If so, altitude was sufficient for good radio/radar reception. On the other hand, if lower, radio reception would have been handicapped; possibly by that marginal difference of receiving and then losing the Pt X tacan at the estimated 171-174 mile range noted by the pilot.

At the time of the short nibble from the tacan, the pilot was yet to sight land or lights. It seems strange that he did not alter course left towards the station for at least a few minutes to see if it would register again. This indication and the wet compass were two against one (the G-2 compass) for a left alteration.

Sundown occurred when this flight was about halfway to its destination toward the east. This would mean that when sinking below the western horizon, the sun should have been almost directly behind the plane if it were on a correct course. The compass variation for the area in question is zero degrees. Moreover, for the time of year, the sun was just about directly overhead at noon, or due west at sunset. Even for an hour after sunset, its diminishing light still makes it possible to ascertain its location. Neither the pilot nor passengers make reference to this available celestial navigational assistance. Moreover, after sundown, it is a pity that at least one of the not-so-tired crewmen could not assist with a little elementary star knowledge.

It is easy to Sunday quarterback this incident on what should have been done. And it seems a good supposition that had the pilot not been so tired, he would have thought more clearly and saved the airplane. Considering his long day, maybe he should be given some credit for the excellent ditching/crew recovery without injury and not making the period a *total* loss.

Impaired Flight Controls



I was second section leader of a flight of A-4Bs scheduled for an inflight refueling exercise. The leader briefed the flight. We filed our DD 175 with operations and proceeded to the flight line.

I conducted a normal preflight, which included movement of the flight control stick prior to entering the aircraft, in order to verify hookup of the hydraulic flight control package. A complete elevator trim check involves running the elevator trim to full down position, override trim in the center position, full up trim, override trim in the down position, retrim to below 6-degree nose-up and normal electrical trim to the 6-degree nose-up position, in preparation for takeoff. Upon signal from the plane captain, I rotated the flight control stick so as to actuate all flight control surfaces, with the final position of the controls being full left rudder, left aileron up and elevators actuated to the nose-up position.

During taxi to the takeoff end of the runway, I again checked the trim position but did not further actuate the flight controls.

We made a section takeoff with myself as leader in the left-hand position. Pre-takeoff run up checks were conducted in the normal fashion, including verification of trim settings. No warning lights or other abnormal conditions were noticed. During takeoff and approaching 2000 ft prior to lift off, I again checked the elevator trim setting and verified it to be in the 6-degree nose-up position. During the last 1500 ft of takeoff roll and upon approaching liftoff speed, the aircraft bounced four or five times on the runway as it became light on the wheels. Liftoff occurred at 146 kts.

Immediately following liftoff, the aircraft experienced an accelerating change of position to a steep nose-up attitude. I attempted to overcome this by forward pressure on the control stick and was unable to do so. My immediate reaction was that I was experiencing a *runaway nose-up* trim. I left the throttle set at 100 percent, checked my airspeed and found it to be 150 kts, and simultaneously commenced override trim to the full nose-down position and rolled the aircraft to the left side to avoid stalling out.

As the nose approached a position about 10 degrees above the horizon, I rolled the wings level, actuated the wheels UP and deployed the drop-out generator to disconnect the trim motor. I considered switching to manual fuel, but decided against it in view of

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the high power setting and the proximity to the ground.

At this time the aircraft experienced a continuation of the change of attitude toward the nose-up position. My first reaction was that through some malfunction the elevator's trim motor was continuing to change the elevator's trim setting to full nose up. However, upon checking the indicators, I found the setting to be 1 degree nose down.

About this time I suspected that the problem involved a malfunction in the continuity of the flight control system and considered actuating the manual disconnect. The fact that I had use of the elevator flight control from neutral aft but no use of the flight control forward of neutral, caused me to decide against disconnecting for fear that the problem might be such that if I disconnected, I would only further aggravate my condition; or that the problem might be in the trim setting (in conjunction with a failure of the indicators) and that disconnected flight controls would make it that much more difficult to override.

The aircraft could not be stabilized above 150 kts, but by utilizing wingover type maneuvers to avoid stalling the aircraft, I managed to climb out to 16,000 ft. During this time, my wingman notified the flight leader and ground station of my condition and attempted to assist me in such ways as he was able. At 16,000 ft the speed brakes and flaps were actuated in an attempt to find a more stable flight condition. Actuation of the speed brakes and flaps proved to further aggravate the nose-up condition, even after the power was stabilized.

Eventually we were cleared to reduce altitude and we descended to 10,000 ft where I dumped all but 300 lbs of fuel and experimented with the aircraft in a wheels and flaps DOWN condition. Upon finding that the aircraft was controllable at this weight and configuration, I elected to return to the field and attempt to land on runway Four. Although runway Four involved a crosswind of approximately 10 kts, 50 degrees off the runway heading, it afforded me the advantage of a sparsely populated final approach.

Before commencing the landing I reviewed the low altitude bail out procedure with a man who had replaced my wingman. A straight-in approach was commenced with the elevator being set at 0 degrees and some nose-up pressure being required on the flight control stick to maintain the proper touchdown attitude with the power settings which were being used to lose altitude. Touchdown was a little long, but otherwise normal. I shut down the engine on the runway and rolled to a stop opposite the Navy ramp.

The hydraulic disconnect had been actuated accidentally prior to the previous flight. The aircraft was downed for stiff pitch control. The control was re-set incorrectly in that the pin seat was allowed to snap completely past the pin, thereby placing the pin against the forward portion of the pin-seat casting. This condition restricted the stick to aft movement only. On preflight, the cockpit wipe-out may have been accomplished in the aft-of-center area. All trim indicators were normal.

My own preflight check has been changed because one which involves a rotation of the stick may involve rotation in an area aft of any blockage. My recommendation is that NATOPS procedures be rewritten to call for the stick being actuated to all four corners of the cockpit and released to neutral on each actuation.

Although there was nothing to indicate that jettisoning the wing tanks would have helped the condition of the aircraft at the time the incident occurred, it eventually became clear that the aircraft was manageable at lighter gross weights and low airspeeds (below 150 kts). If the tanks had been jettisoned immediately, the condition of the aircraft would have been aggravated by increased airspeed unless the power had been reduced. Slight reductions of power could have been safely accomplished, providing pilot technique was adequate to meet the situation.

An accident was avoided by remembering that attitude controls airspeed and power controls altitude. Good luck, basic flight theory and good basic procedures continue to be important.

Be Prepared

On a canned instrument hop I was cleared for a tacan penetration in my *Skyhawk*. I was informed that no precision radar was available so I accepted a tacan low approach. Here begins the confusion. The tacan is approximately six miles from the approach end of runway 22, and it is the beginning for let-down minimums.

With head-up-and-locked, enjoying the beautiful VFR day (after a demanding previous approach at another base in real fog, I began my letdown at the tacan six-mile gate which existed only in my state of complacency and euphoria. Two miles from the tacan and 1500 ft below minimums, I suddenly noticed no runway below. Fortunately for me, the weather was CAVU. I shudder to think of making the same mistake at night or in IFR conditions. Prevention is simple: Know the approach and any possible deviations that may occur in the course of a flight—*Be prepared.*

Reader Questions Headmouse Answers

Have you a question? Send it to Headmouse, U. S. Naval Aviation Safety Center, Norfolk, Virginia 23511. He'll do his best to get you and other readers the answer.

Hip Shot

Dear Headmouse:

Our A-4 squadron was based on a carrier off of Vietnam. One of our more stellar type pilots had purchased his own special type of side arm because he felt the regular issue .38 cal revolver was inadequate. His selection was a .357 Magnum pistol which he carried fully loaded with six rounds. This procedure naturally caused one round to be directly under the firing pin at all times.

This individualistic aviator literally armed to the teeth, was launched on a strike. Enroute to the target and before crossing the coastline, misfortune entered the cramped cockpit. Unknowingly, he inadvertently snagged the hammer of the .357 causing it to accidently discharge. Not fully realizing what had happened, the pilot instantly suspected he had been hit by enemy anti-aircraft fire because of the explosion. Simultaneously smoke began to enter the cockpit and his left side began to ache.

He quickly reversed course to return to the carrier, but upon seeing that his aircraft continued to function normally, his adrenalin subsided somewhat. The pilot realized that his position over the ocean precluded the enemy from being the cause of the trouble. Looking down at his left side, he did not see any damage to the fuselage and quickly suspected his pistol had caused the crisis. The shot had severed his oxygen line and caused a communication failure. Although his left cheek (not referring to his face in this instance) stung smartly, he was relieved not to find any blood.

After a safe landing back aboard the carrier, the embarrassed pilot was forced to attend a number of meals and some of his other activities in a standing position. The bullet was found imbedded in the seat pack.

SHOT MOUSE

▶ The .38 cal revolver issued to pilots has been in safe use for many years. It was partially selected because it was not prone to accidental discharge. During the early part of World War II, the .45 cal pistol was the common side arm for pilots. It had several bad aspects including a tendency for accidental discharge. Operational use by crewmen has proven the .38 cal revolver to be the best compromise.

Revolver type side arms can be carried safely if the chamber under the hammer is left empty. Pilots who carry something besides the standard issue .38 revolver should double check for hair triggers and other accidental discharge peculiarities.

Very resp'y,

Headmouse

Life Vest Snaps

Dear Headmouse:

Recently the crewmen of this unit have had trouble with the locking snaps of the new type Mk-2 life vest. It seems that the post goes into the hole of the snap too far, causing it to jam. Consequently the vest is pulled apart with such force it rips the material causing the jacket to leak.

I believe the old type vest snap without the hole all the way thru it was much more effective, since I never had one jam on me. Is there any chance that in the future those old type snaps might be placed on the new type vest?

PR2 R. T. PERKINS
U.S. NAVAL AIR MINE DEFENSE DEVELOPMENT UNIT
PANAMA CITY, FLORIDA

▶ What you describe as the "old type vest snap without the hole all the way through it" and which you recommend using on this vest instead of the snap you now have is the new snap which should be on it. Without seeing the vest, of course, we are at a disadvantage.

Squadrons, support and supply activities experiencing engineering, maintenance or related technical problems involving survival equipment listed in Naval Air Systems Command Instruction 5400.-11 are authorized to correspond with the Naval Air Engineering Center, Aerospace Crew Equipment Laboratory, Code C-7.

Immediate information can be obtained by telephone Area Code 215, 755-4161. (Personal/Survival Equipment Crossfeed 11-66 refers.)

Very resp'y,

Headmouse

Would You Believe?

Dear Headmouse:

Would you believe; that a NATOPS Inflight Guide Book almost caused an accident? Then would you believe that some pilot got a little forgetful with the stowage of his Inflight Guide?

This incident came to light with a "gripe" on the yellow sheet of a *Cougar* that read, "Little ole number—was a dog and couldn't keep up with the pack." Investigation by maintenance personnel led to the discovery that the Inflight Guide (see attached picture) was plastered over a large portion of the J48 engine compressor screen.

If there can be a gratifying note to this fiasco, it would be that all applicable changes were entered in the plastered publication.

Incidentally, no one inquired as to

NATOPS Scooped!

the note on the squadron bulletin board: "Anyone recently misplacing their Inflight Guide, pick up same at the squadron safety office."

SAFETY MOUSE

▶ It seems pretty obvious that the pilot-owner of the NATOPS Inflight Guide in question *rested* (and nearly rested himself) the document in the edge of the air intake scoop while he made an external inspection of the airplane and/or his flight gear. Then something caused him to forget and blast off without another thought about the book. If he was making an external inspection, it could not have been a very complete one or he would have corrected matters. This incident can join the long line of air and ground crews who have temporarily placed items in the air scoops to subsequently become FOD. Moral: Air scoops are for nothing and that nothing is air, invisible air.

Very resp'y,

Headmouse

Fumes

Dear Headmouse:

After completion of my final hop for the day, I turned my oxygen mask in for hose replacement and installation of a new laminar seal. This was about 1400. The pararigger assured me the mask would be ready for my first hop next morning (0700 brief). Being aware of the dangers of fumes from the glue, I asked him if it wasn't necessary to dry the mask for 24 hours. "No sir, we have a quick drying glue." Results were as might be expected: Fumes in the mask and nausea in flight.

I am presently flying F-9s in the training command. I would estimate I inhaled these fumes for not more than five minutes yet this was enough to cause nausea and a slight dizziness.

Proper understanding of safety precautions by both pararigger and pilots is the only solution for this problem. I have already initiated action at the squadron level to correct this lack.

DIZZYMOUSE

▶ Readers who are unaware of the potential danger of glue fumes in oxygen masks and Mil Specs on drying time will find pertinent information contained in "Glue Jag," April 1966 APPROACH, p. 22, and "Sticky Problem," June 1966 APPROACH, p. 22.

Very resp'y,

Headmouse

Chocks and Blasting

Dear Headmouse:

The A-4B was taxiing out from the line with a new pilot checking out. He used so much force to move out, that he blasted another A-4 on the next line which was my responsibility. It should have had chocks on all wheels but only one was blocked as a temporary measure while I hunted down more chocks. While looking for more chocks, something else distracted me and I did not hurry back with more chocks. Upon hearing the blast, I looked up and saw my A-4 start to roll from the action. Fortunately, I was able to stop the A-4 before it struck another. It was summarily returned to its regular parking place and chocked according to squadron directives. My error almost caused an accident but the pilots should be instructed not to blast nearby parked aircraft.

MECH MOUSE

▶ Linemen must be quick about chocking aircraft and pilots must have due consideration for the damage their jet blasts can do.

Very resp'y,

Headmouse

Arresting Gear

M-2 expeditionary (Morest) has two hydraulic units (M-5 shipboard type). Bidirectional. Max engaging speed at 50,000 lbs—88kts.

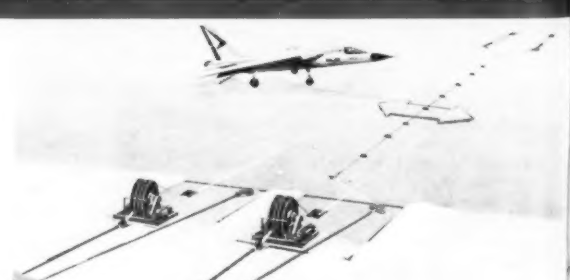
KNOW THE SYSTEMS!

Everyone who uses, operates, maintains or inspects an airfield arresting system must understand its purpose, limitations and operating techniques. This knowledge is particularly essential for pilots who may experience field arresting gear engagement for many reasons—aborted takeoff because of engine failure; faulty brakes; wet runway; blown tire; gear up and landing long, to name a few. They should be thoroughly familiar with the capabilities of the arresting gear, its location, availability, operational status and the type of engagement used.

Whether an arrestment prevents an aircraft accident or reduces accident severity depends on the coordinated effort of all personnel concerned with operating the arresting gear during an emergency.

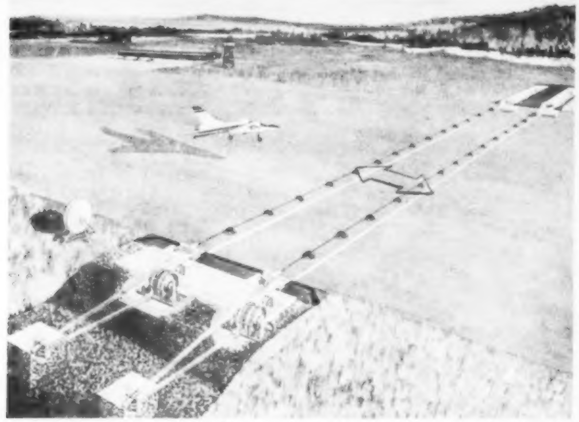
ARB No.		USN Model	Type
42-12-A	(20 AUG 64)	E-14-1	Water squee (bidirectional)
43-12-C	(14 JUN 65)	E-27	Rotary Friction with nylon tape (bidirectional)
44-12	(8 NOV 65)	E-15 (300 ft span)	Two E-27 gea (bidirectional)
46-12	(16 MAY 66)	E-28 (200 ft span)	Rotary hydrau (bidirectional)
47-12		E-5/E-5-1 (150 to 800 ft span)	Chain (single direc
48-12	(16 MAY 66)	E-15/E-15-1 (200 ft span)	Two E-27 gea (bidirectional)
40-12A	(9 APR 65)	M-2 Morest	Mobile (2 hy units) (bidirec
45-12	(29 MAR 66)	M-21 Morest	Mobile Rotary (bidirectional)
			Rotary Friction with nylon tape (bidirectional)

E-5/E-5-1 chain. Not bidirectional. Max engaging speed at 50,000 lbs—150 kts. (Min 977 ft heavy chain required.)



E-15 has two rotary friction brake units (E-27). Bidirectional. Max engaging speed at 50,000 lbs—136 kts.

E-14-1 has two tapered tubes and works on the water-squeezer principle. Bidirectional. Max engaging speed at 50,000 lbs—160 kts.



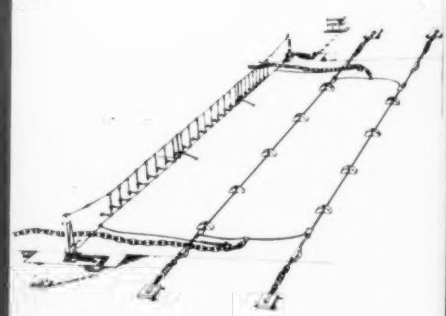
E-27 has one rotary friction brake unit. Bidirectional. Max engaging speed at 50,000 lbs—124 kts. (Dual installation)

USAF Mod.
BAK-6
BAK-9
Two BAK-9s
—
—
Two BAK-9s
—
—
BAK-12

Lack of pilot familiarity with various types of gear on military airfields has often led to landing mishaps. All air station operations officers and pilots should read and be thoroughly familiar with the contents of the Aircraft Recovery Bulletins (ARB).

Enroute Supplements (Flip Charts) list arresting gear/jet barrier systems available at various aerodromes. It behooves every pilot to be thoroughly familiar with the available systems.

Some of the arresting gear/jet barrier systems listed here are depicted to acquaint you with the fundamentals of each type. *Caution: maximum engage speeds and gross weights are typical and are listed only to show basic differences in each type of gear.*

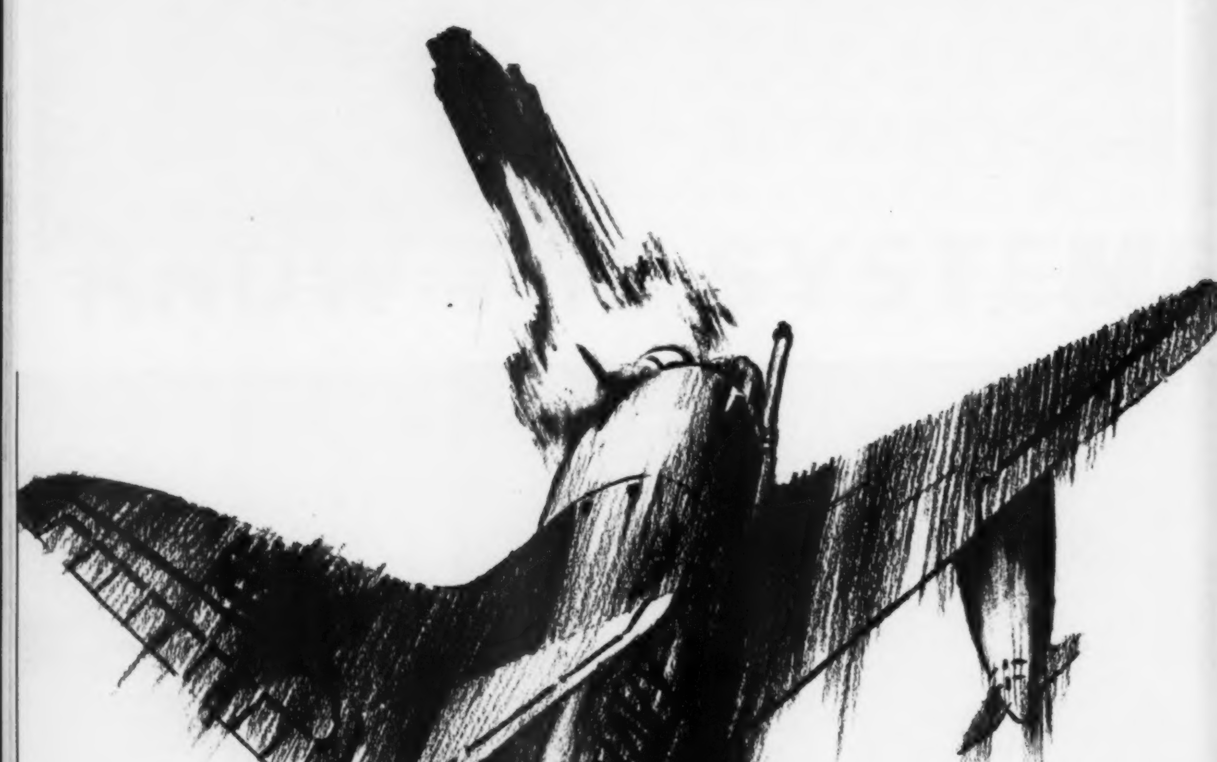


MA-1A (modified) is combined jet barrier and arresting gear pendants. Max engaging speed at 30,000 lbs—140 kts. MA-1A: sans arresting gear pendants. Both not bidirectional.

E-28 has two rotary hydraulic units. Bidirectional. Max engaging speed at 50,000 lbs—160 kts.

M-21 expeditionary (Morest) has two rotary hydraulic units. Bidirectional. Max engaging speed at 30,000 lbs—150 kts.

REFLEX ACTION



As his wingman transmitted "Eject! Eject!" the pilot of a KA-4C, without a conscious effort at positioning, pulled the alternate ejection handle with his right hand. The canopy went off and the seat fired at 450 ft in an estimated 45-degree bank. He tumbled mildly and before he could reach up to pull the D-ring, the parachute opened. Seconds later he was in the water.

"I was initially dragged face down underwater," he recalls, "and I was unable to find my parachute release fittings. Reaching underwater, I held my oxygen mask tightly against my face and was able to breathe although there was water in the mask. Shortly after that the parachute collapsed and I was upright.

"After inflating my Mk-3C, I released my parachute fittings, removed my oxygen mask and took off my flight gloves. At this time I became aware that I was entangled in the shroudlines. I pulled out my strobe light, turned it on and positioned it behind my neck with my flight suit holding it. Unable to find my shroud cutter, I took out my survival knife and cut my way clear. During this evolution I experienced mild difficulty in maintaining an upright position because my feet wanted to come to the surface, forcing my face down into the water. While I was cutting myself from the shroudlines, I lost one of my flares from the Mk-3C. I had pulled out this flare to have it ready for the helo and had dropped it when I continued cutting the shroudlines.

"After I freed myself from the parachute and shroudlines, I pulled out my other flare but was unable to determine which was the right end. It felt like there were bumps on both ends. When the E1-B flew over me the second time, I fired the flare and I could see the helo coming from a distance.

"I was unable to find the lanyard to the life raft or open the seat pack—I was still attached to the pack by my oxygen hose. I do not recall releasing the rocket jet fittings that attach to the pack. (*This plus the fact that he had trouble floating upright leads one to believe that he might have been still strapped to the seat pack.—Ed.*) My helmet was on at all times. The helo water pickup was uneventful.

"Prior to the aircraft exploding it never occurred to me that I would be unable to land aboard ship. I never thought of ejecting until I felt and saw the explosion and then it was a reflex action."

The investigating flight surgeon made the following comments on survival equipment and procedures in this ejection:

- The pilot was unable to find the lanyard to the life raft and was unable to open the seat pack. Although a prolonged survival situation would have undoubtedly stimulated further resourceful attempts, it is felt that he was inadequately familiar with the proper procedures for utilizing his survival equipment. The pilot had missed a squadron briefing on the ejection seat and the utilization of survival gear held two weeks prior to the mishap.
- On inspection the pilot's .38 caliber pistol was found to be jammed and unworkable. The pistol was not used in the mishap, however.
- One inflation pocket of the pilot's Mk-3C life preserver had a hole in it. The Mk-3C was inspected two weeks before the accident and was in good condition. The hole is believed due to a laceration while the pilot was cutting shroudlines. He had no difficulty staying afloat with one chamber of the Mk-3C inflated.
- The pilot had some difficulty in maintaining an upright position in the water. The other difficulty that he encountered was holding the ACR-4F strobe light. He felt that the right shoulder mounting pocket was too low to be seen. Below eye level the light was also quite distracting to the survivor. While the pilot was holding the strobe light in his hand he could not engage in other useful maneuvers.

The following pieces of survival gear worked exceedingly well and were materially responsible for the physical well being of the pilot:

- *Ejection seat.*
- *Oxygen mask and emergency oxygen bottle*: The ability to breathe while being dragged under water by the parachute was in itself probably life-saving.
- *Parachute deflation pockets*: The parachute drag was halted by the automatic collapse of the parachute before the emergency oxygen was completely expended.
- *ACR-4F strobe light*: The survivor's strobe light was easily seen by the rescue aircraft.

Rescue communications were optimum, the flight surgeon reported. "The rescue was directed and performed with maximum proficiency and professionalism."

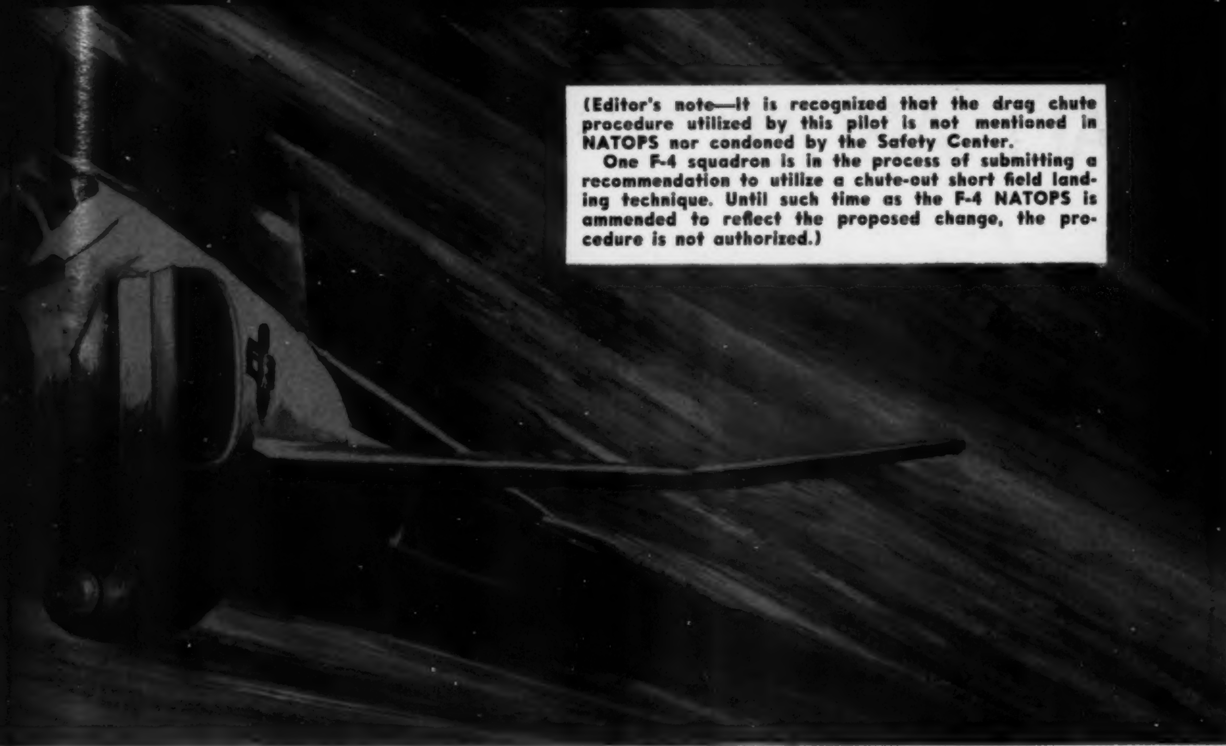
Among the flight surgeon's recommendations was that an above-eye-level ACR-4F strobe light holder, a small bracket or loop, be placed on the hard hat to hold the strobe light. (Subsequent to this accident, the Naval Air Systems Command released a proposed bulletin on this to the fleet for evaluation. As of this writing, evaluation is not complete.)

Night DR Bingo

By LT(JG) E.R. Davidson, VF-143

At 0430 our F-4B was cleared for a random radar GCA after an uneventful NORAD intercept exercise. With the landing check list completed I prepared to enter the thick thousand-foot overcast at NAS Miramar, thinking that in a few minutes I would be relaxing in the readyroom. At four miles on final, my reveries were interrupted by the emergency power light on the CNI console, a wisp of smoke in the cockpit and by the noticeable silence which had replaced the soothing voice of the GCA controller. My RIO acknowledged the emergency power light, and as I added power and cleaned up he confirmed that we had lost our entire communications and navigation package, but added the comforting knowledge that NATOPS said that we still had a radio. While making several climbing 360s over the field, we decided that it would be more prudent to depart for our VFR bingo field, MCAS Yuma, than to wait for a possible pick up by one of the fighters returning behind us. As we departed home plate on our impromptu night VFR dead reckoning nav exercise, we were thankful that we observed SOP and commenced the original approach with sufficient fuel for a 135-mile bingo to Yuma. We had an occasion a short while later to be even more thankful we hadn't scrimped on fuel.

The uneasy feeling that all was not well began creeping into my G-suit as we crossed the mountains on our bingo profile. For instead of the star-sprinkled crystal clarity of the desert nights so often advertised by local real estate agents and Yuma metro, we discovered that a rare desert phenomenon called cloud cover had interposed itself between us and our intended bingo field. When we arrived overhead where our destination should have been, we were unable to find any beacons or runway lights. That old sinking feeling had now grown to proportions appropriate for a night cold cat shot. (Center tracked our emergency IFF directly over the field, but we discovered during a subsequent deployment to this field that they often turned out the runway lights when no aircraft were in the pattern.) With the aviator's instilled distaste for walking, we elected to hold our altitude at 20 thousand until we either spotted a place to land or were overcome by Newtonian forces. We circled the area and could discern the lights of towns, but were not positive of our location as we had not been in the area for a year and a half, and hadn't made more than



(Editor's note—It is recognized that the drag chute procedure utilized by this pilot is not mentioned in NATOPS nor condoned by the Safety Center.

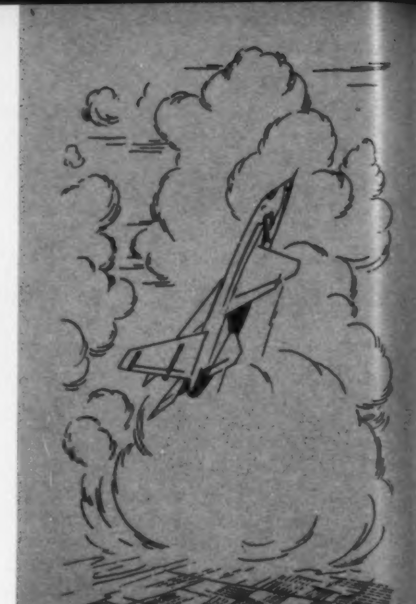
One F-4 squadron is in the process of submitting a recommendation to utilize a chute-out short field landing technique. Until such time as the F-4 NATOPS is ammended to reflect the proposed change, the procedure is not authorized.)

a few night VFR hops since becoming all-weather aviators. With the fuel gage below 2000 pounds, I spotted a military beacon to the northeast and headed through the haze toward the intermittently visible light with both throttles bent firmly around the idle detent. When we finally cleared the haze, it became uncomfortably apparent that the semi-lighted runway adjacent to the beacon had been originally constructed for model airplane meets, all three thousand feet of it. On the first pass I couldn't even tell whether the strip was paved or not because of the intense darkness, but I thought I had seen a patch of white near the beginning of the lights. I hoped it might be paint on the end of the pavement, so I wrapped it up and dropped the gear and flaps. I eased the bird in and gingerly bounced it a few times. The runway surface felt hard, so I bent it around for a final pass. The drag chute went out on the approach, a technique which I had practiced for short runways after observing the normal two or three thousand-foot roll prior to full blossom of the chute when it is deployed after touchdown and idle throttles. We touched down with the nose rotating up through rudder shaker, the airspeed descending through 120 kts, and the fuel gage at less than a thousand pounds —enough to make one more very tight pattern if we had to take it around. With immediate application of the binders, we came to a smoking halt in about 2500 ft, and let the bird roll leisurely for the last 500 ft. We didn't even blow a tire, thanks to the sacrifice of a number of those 26 plies.

As we cleared the runway, which the taxi light revealed to be all of 5000 feet with only the middle three lighted, the RIO dismounted to walk ahead and check the condition of the taxiway and ramp. We shut down shortly before flameout next to a very small Army spotter plane, after 2.5 hours of flight time in a bird with no external fuel. We found a telephone and called the operator, requesting that she trace the call to find out where we were so that we could inform home plate. The troops at Laguna Army Airfield gave us an Admiral's welcome (and plenty of Army Proving Ground stencils on the airplane) and lent us a light load of the JP they kept on hand for their jet powered helos. MCAS trucked a starting unit 30 miles out into the desert to us, and at 1100 we took off in burner and ground effect across the sand dunes toward home.

ALL ABOUT

FALSE



The crash site was just off the end of the runway. The jet had started a missed approach from a practice VOR/ILS low approach. The men on the night shift in the control tower watched as the aircraft leveled off, began to climb, then suddenly pitched down and nosed into the ground.

After a meticulous examination of the wreckage, the investigation team published its findings. The aircraft had no mechanical difficulties. All four engines were producing full power at impact. Flight controls had not malfunctioned. Pathology reports likewise cleared the crew; there was no evidence of carbon monoxide or alcoholic poisoning, no hypoxia or deficiency in blood sugar.

But a mission flown to reconstruct the flight produced a few interesting observations. There was total blackness in the area of the crash. Once past the runway, there were no ground lights for visual reference. And since the jet was much lighter than its normal mission takeoff weight, it accelerated much more rapidly. This induced the sensation of a steep climb. It doesn't take much imagination to figure what could have happened here. A sudden passage into complete blackness, combined with the sensation of a steep climb—the pilot probably felt that he was going straight up and really shoved that yoke forward.

One of the hardest parts of instrument flying is learning to completely disregard signals from the body's equilibrium organs. In fact, most of the time spent in instrument flight training is actually used in learning to ignore these false sensations.

An example of this is the person who can fly perfectly in the instrument trainer, yet is literally all over the sky when actually under the hood. No one becomes an accomplished instrument pilot unless he learns that his body sensations are always wrong when they disagree with the total picture presented by the flight instruments.

But disregarding a lifetime's worth of learning to balance yourself is difficult at best. A far better method would be to avoid the flight situations which produce spatial disorientation, or vertigo, whenever possible. Let's see what causes these sensory illusions and if you really can avoid them.

Losing direct contact with the ground causes a lot of internal problems. Your sense of balance is normally maintained through a learned ability to interpret sensations in your eyes, muscles, joints, tendons, skin, abdominal organs, and a part of the inner ear called the vestibular organ.

Sometime during the course of undergraduate pilot training, most of us were exposed to the drawings of this vestibular organ, a three-dimensional pretzel found in the inner ear. Since this is a pretty important apparatus for maintaining equilibrium, and the prime cause of false sensations, we'll review its functions briefly.

As three dimensional pretzels are hard to come by, for illustration we'll use something more readily at hand: a martini glass. This has to be the thin stemmed type, because of the nature of the demonstration.

Holding the partially-filled glass (olive removed)

By Capt. Raymond L. Kuhlman, USAF

SENSATIONS

by the stem, start spinning it between your fingers. Note that at first the liquid in the glass remains stationary, then gradually starts spinning and catches up. If you stop the glass rotation suddenly, or even slow it, the liquid keeps moving for a time. Suddenly reversing the direction of spin will have the glass and liquid moving in different directions.

Your head, in effect, has a set of three of these martini glasses at right angles to each other in each ear. Sensors inside each ring detect a difference in motion between the glass and the liquid within. When your head moves to either side, it causes a sensation in one ring; when it moves up or down, a sensation in a second; and when it moves back and forth, a sensation in the third ring.

What happens when all three get going at once causes more sensations than a discotheque go-go-girl. You can get the feel of this with a turning chair, preferably with arms, seat belt and firm base. After tilting your head back, have someone spin the chair. Then snap your head forward. The result is a completely uncontrollable loss of equilibrium and a feeling of tumbling out of the chair sideways.

This would really incapacitate a pilot and explains why *head movement should be kept to an absolute minimum during instrument turns.* Leaning forward and bending slightly to reset a course will activate the fluids in all three rings. Straightening up could cause the same type equilibrium loss you got in the chair. This could result in a sloppy turn, if not a complete spin-in.

If you watch a person demonstrating the turning chair effect, one of the things you'll notice is that he searches frantically for an outside object to get a visual lock on some fixed reference. This identifies the eyes as the secondary sensory organ and also

explains why turning and head motions seldom cause vertigo when flying VFR. Picking up an outside point for visual reference helps the brain orient itself. When on instruments, either in darkness or weather, your eye can't fix on anything outside the cockpit. Equilibrium is easily lost and hard to regain.

The remainder of the sensors can be grouped under nerve stimuli, the old "seat of the pants" flight references. While these sensations are important in detecting impending stalls during low-speed or high-G flight regimes, they're no good for blind flying. The increased G-force in a level, coordinated turn produces the same seat pressure as a climb. Releasing this back pressure while rolling out after a prolonged turn will make you feel like you're entering a dive.

In uncoordinated flight, a variety of sensory illusions can occur when flying by the seat of the pants. A skidding turn will feel like a bank in the opposite direction. A slip will feel like a much steeper degree of bank. A sudden pull-up may feel like a high-G turn. The trouble here lies in the fact that, on the ground, gravitational cues are used to orient yourself to the earth. But in flight they can only orient you to the center of gravity of the aircraft.

Several tests have been run to see how people can determine an aircraft's attitude when blindfolded. In static tests, nonpilots were found unable to detect slow pitch changes less than 24 degrees up and 11 degrees down. Experienced pilots, on the other hand, could detect pitch changes of 7 degrees up or 4 degrees down.

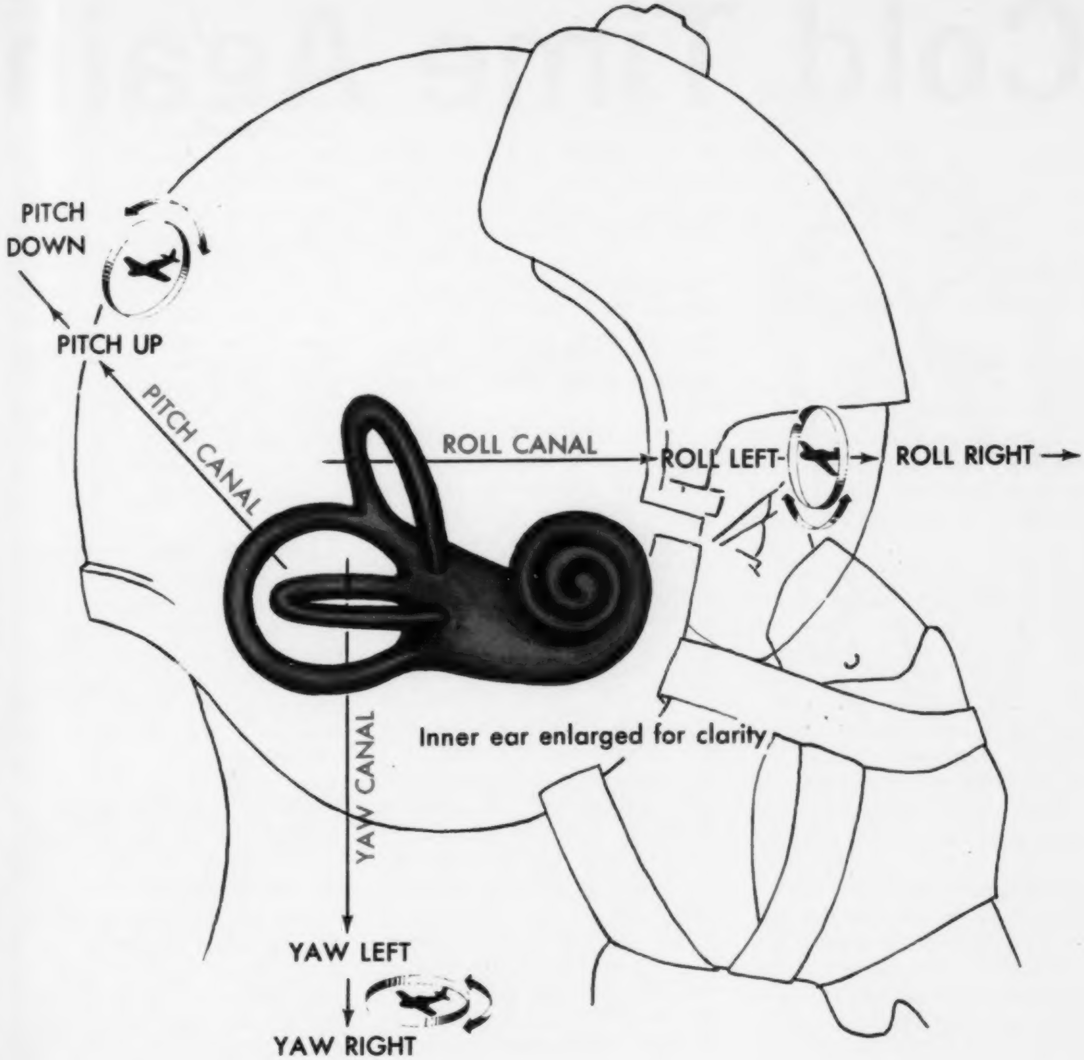
But simulated flight maneuvers were a different story. In judging whether the aircraft was climbing, diving or level, pilots were wrong 39 percent of the time. In judging whether in a left or right bank, or level, they erred 37 percent on the test. But when pitch and bank maneuvers were combined, the error rate jumped to over 60 percent.

Most of your false sensations while flying on the gages will be a combination of effects on the inner ear and the seat of the pants organs. Since light G-forces and turns slower than two degrees-per-second will have little effect on those sensors, we can put them to work in our favor. Most disorientations are caused by erratic or at least not very precise flying. Keeping rates of roll-in and roll-out turns equal and G-forces constant throughout a particular maneuver will keep the old body clued in. If the aircraft should wander into a bank by itself, a slow roll-out will usually prevent disorientation. A sharp return to straight-and-level will have you feeling you're turning the other way for quite some time and make maneuvers difficult. And don't transfer control of the airplane to the other pilot while in a bank, climb or dive unless it's an emergency.

One other source of disorientation comes from visual reference to a false horizon. A long stretch between two cloud layers is a good place to get this. It's also a good place for a midair collision, so you have to be on the lookout, but refer to your instruments frequently. Otherwise you'll be setting yourself up for a good case of vertigo when you start a climb or descent through one of the cloud decks.

Fatigue doesn't cause sensory illusions but it will compound them. Studies of fatigue and instrument flying have shown that the tired pilot is less self-critical and his nerves are more sensitive. This triples his susceptibility to disorientation. He will be more prone to false sensations, yet rougher in his instrument flying and more likely to induce disorientation. Two common times for vertigo to occur are while bracketing a final approach course or on a precision final in turbulence. A break before starting an instrument approach, even if it's only sitting back while the other pilot takes over, maximum use of the autopilot and close monitoring of even routine approaches by the copilot are good ways to guard against these effects.

Instrument flying requires ignoring many strong sensory illusions, and the rapid acceleration and high performance of the newer jet transport and service aircraft add to the problem. The accomplished instrument pilot counteracts these adverse effects by giving himself every advantage. He keeps head movements to a minimum, especially when turning or accelerating, doesn't reset course lines or other instruments during a turn. He makes roll-in and roll-out of turns smoothly coordinated and at a constant rate. And he believes only what his instruments tell him.



Three semi-circular canals, filled with fluid which is free to move, are located in each inner ear. They produce true (and false) sensations of motion. They lie in three planes, each 90° from the other, and each canal is responsible for a sensation of motion in one of the three axes about which an aircraft can move.

Cold Time Again

This is the time of year in upper latitudes when colds—known to you flight surgeons as "upper respiratory infections" or URIs—take their toll of squadron personnel. Your best defenses against the misery and nuisance of a cold are plenty of sleep, proper diet and exercise.

Upper respiratory infections (colds) are caused by germs within the air passageways. The infection caused by these germs is an acute inflammation of the mucus membranes which line the passageways. Irritation, mucus production and swelling give rise to such symptoms as sore throat, runny nose and head congestion. If the infection moves up into the sinus area, sinusitis develops with the typical sinus headache. If it goes down to the vocal cords, laryngitis develops with the resulting change in or loss of voice. If the infection goes further down into the lungs, the resulting bronchitis causes the various symptoms of cough, chest pain and wheezing. The disease process, therefore, is basically the same in each area, but the symptoms are different. In all cases, certain generalized symptoms are experienced such as fever, aching muscles, poor appetite and disinterest.

Germs which are capable of producing such infections are always present in the nose and throat. However, infection is prevented by white blood corpuscles which constantly destroy these germs and prevent them from invading the tissues. When one's resistance is lowered, these defending blood cells are weakened and an infection, or cold, is likely to result.

Inadequate sleep, poor eating habits, and poor physical conditioning are the usual causes of a lowered resistance. Exposure to cold weather without proper clothing further reduces one's resistance, and an equally harmful situation is the exposure to dry, un-humidified air which heats many work spaces and homes. These two factors are largely responsible for the greater number of respiratory infections during this time of the year.

Now that the season is upon us, thoughts about prevention are in order. Again adequate sleep, regular meals, exercise, and moderation are important. Proper outdoor clothing should be worn, and some method of increasing the humidity of the warm, dry air indoors is desirable.

The white blood corpuscles are your best ally in preventing the URI. Give them a chance, keep your resistance built up and avoid that miserable "cold."

notes from your flight surgeon

Prop Incidents

FLIGHT deck personnel are still wandering through the prop arc area of the E-1B. In one incident, a blue shirt walked between the prop and the fuselage just after the blades had come to a stop. The aircraft mags were still ON. In a second incident, the pilot had his fingers on the starter switch when a blue shirt ran through the arc of the blades while he was coming up from the catwalk.

There are fewer prop aircraft on board than on past cruises so warnings should be emphasized more. "Beware of Propellers" signs will be placed at strategic areas. A continuing campaign of awareness and indoctrination will be carried out by all Air Wing and Air Department officers and leading petty officers.

—Safety Council Minutes

Mysterious Drownings

STATISTICS show that about 6500 people drown each year. Many individual drownings are tagged as mysteries because the victim was a good swimmer and was in excellent health. Also, the drowning occurred in well-supervised pool or beach areas. So, what caused these drowning accidents?

Recent studies show that two factors, both related to breathing, are frequently the cause of mystery drownings:

- Swimmers sometimes over-breathe or hyperventilate before going under water. This over-breathing depletes the supply of carbon dioxide causing a delay of the natural urge to breathe.
- Swimmers hold their breath for too long a period underwater, causing an oxygen insufficiency.

In each case, the swimmer loses consciousness with little or no warning. He may even continue to swim for a few seconds. This is the reason that other swimmers, and even well-trained life-guards, may not sense the trouble until it is too late.

To prevent such accidents swimmers should obey their natural urge to breathe normally and avoid over-breathing.

—FAA Horizons

Unloaded

A PILOT of an A-1H which crashed in the desert was flying with an unloaded survival pistol. On impact his right arm was broken and he was unable to load or fire his pencil flare gun or his day/night distress signal. In spite of his injury he managed to load and fire five rounds from his pistol. He was rescued by helicopter.

Flight surgeon's recommendation: "All pilots should make periodic inspection of their personal survival gear. The .38 pistol should be carried loaded. Had this accident occurred at sea it is very unlikely that the pilot would have been able to load and fire his pistol with a broken right arm."

Deficiencies

SURVIVAL preparation and technique were far from adequate in the case of both the pilot and Rear Seat Observer (RSO) ejecting from an RF-4B, the investigating flight surgeon reported.

Neither man wore his survival vest although this was in violation of squadron SOP. Both men wore survival knives attached to their harnesses but without retaining lanyards. The RSO managed to get rid of the few shroudlines tangled around his feet despite the fact that he had lost his knife. However, as the flight surgeon pointed out, if the RSO had become severely entangled, the presence or absence of a small nylon cord attached to that knife could have made the difference between life and death.

The pilot was wearing a loose-fitting borrowed helmet which came off during parachute descent. His shroud cutter was attached to his flight suit belt *inside* his torso harness. His pencil flares went down with the plane in his helmet bag.

"Ease of availability is the keynote to survival equipment usage, not mere possession," the flight surgeon points out. "Nobody carries baggage on an ejection."

The RSO could not light a signal flare because of his unfamiliarity with the procedure. Neither man inflated his life preserver before entering the water. Finally, the pilot entered the horse collar backwards.

"The crew made many errors in survival and rescue preparation and technique," the flight surgeon stated. "These errors were minor in themselves but were potentially dangerous. Each man must prepare himself for all eventualities. Lectures on these matters can only point them out; action is an individual thing . . ."

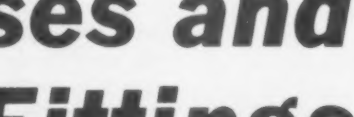
Tape Great

LOCATION of the pilot was greatly facilitated by the white reflective tape on his hardhat. The white tape on the hardhat had the effect of a brilliant flashlight when it was exposed to the floodlights of the helo.

—SAR Helo Pilot

The assembly of a fitting or metal tube can

Care and Repair of Tubing, Hoses and Fittings



By Raymond A. Young, Mather AFB

From a safety standpoint, it may be hard to realize the importance of a few thousandths of an inch as it pertains to plumbing in aircraft. This work is, however, one of the most important requirements in aerospace vehicle and aircraft maintenance. It must be done correctly and precisely.

Aircraft and missile plumbing material is divided into two major categories: rigid metal piping (or tubing) and flexible hose. Both are used to carry highly flammable liquids under high and low pressures.

Metal Piping. Metal piping is round tubing made of copper, aluminum alloy, or stainless steel. The last two materials are predominant in aircraft and aerospace vehicle plumbing, and have one characteristic in common. Both are used in an annealed or soft state. In recent years, heat-treated aluminum alloy 5052, 6061, and 6062 have also been used in high-pressure fluid and gas systems up to 3000 psi.

In comparison with other metals, metal tubing or piping is pliable or soft; therefore, it must be handled carefully. To remove tubing that has been stacked in horizontal piles by pulling a length from the bottom or center of the pile will produce scratches along the full length of the tube. Scratching must be avoided, since it will reduce the burst pressure rating in proportion to the scratch depth. In other cases, tubing has been shipped in sections placed between two pieces of wood and banded with a metal strip. This causes the tubing to become elliptical.

Bear in mind that aircraft and missile standard metal tubing is the thin-wall type, the thickness ranging from .028 to .065 of an inch. Pounding with hammers or wrenches, prying with screwdrivers, using tubing assemblies as handholds, or standing or stepping on them, will obviously cause damage.

Quality Control inspectors should pay particular attention to the areas where the tubing is held in place by phenolic or formica blocks, where clamps are used, or where the assemblies are inserted through lightening or pilot holes. The tubing is likely to wear as a result of vehicle vibration, surge pressure vibrations from pumps, valve openings and closings, or fluid flow and temperature changes. The tubing also wears in these areas if the blocks or clamps fit loosely. This sets up a chatter or hammering, leading to excessive fatigue and metal wear.

can mean mission success or failure.

NavAir 1-1A-8 does not require replacing cracked sleeves on tube connections for system pressures up to 3000 psi if the connection is not leaking. If the connection is leaking, the assembly must be replaced. All cracked sleeves, however, should be replaced when a line is disconnected for any reason. (Note: Replacing cracked sleeves nearly always requires replacing the tube assembly.) It is always better to replace nicked, worn, cracked, or dented tubing, particularly if the replacement tubing can be locally fabricated.

The single flare (MS33584), the double flare (MS33583), the bead (MS33660), and the flareless or Ermeto type are the four types of tubing connections most commonly used in aircraft. Each has its advantages, as well as peculiarities and tolerances in fabrication.

The single flare (MS33584), has been in use over the longest period of time, and many people consider it to be the most dependable. The double flare is an innovation of the single flare, and has a double sealing surface on the inside of the flare. Both flares have tolerances, indicated on the military standard drawings by a minimum and maximum dimension across the flares. The internal angle of 37 degrees and the external angle of 33 degrees must be strictly adhered to.

Tubing nut must not be used to pull assembly into place. Always call a specialist to adjust it correctly.

Many different kinds and sizes of fittings are used in aircraft and missile plumbing. However, each must be used only in the proper place.

Aircraft and missile metal tubing is thin wall and annealed. It must be shipped and handled very carefully.

Flaring Tools. An experienced worker using standard flaring tools will automatically achieve the correct external and internal angles. Homemade flaring tools should not be used, since they can not be manufactured to these tolerances. There is a commercial tool in which the angles vary to a considerable degree. Also, this tool has teeth in the holding block that bite into the tubing. A tube so weakened can fracture under very slight vibrations.

If the proper equipment is not available and hand flaring is necessary, avoid excessive peening, tapping, or hammering on the end of the tube. This causes a "work hardening" of the material, and the flare may eventually split or break off. Be careful not to overflare or flatten the flare below the tube wall thickness by hitting it too hard. The wall thickness will be reduced, and this can result in leaks or fractures under pressure.

Commercial type of auto flaring tools below, far right, should not be used in plumbing maintenance.

The tubing bead has been used for many years. Fabrication of a bead on a metal tube is quite simple, but the hose and hose clamps that fasten onto the beads should be installed or removed carefully. If the torque values in TO 1-1A-8 are exceeded, the soft metal tubing may collapse internally. If it is necessary to remove the rubber hose from the metal tubing bead, do not pry it off by jamming or inserting a sharp object between the hose and tube. This will scratch the tube end inward. It may also restrict the flow of fluids through the tube.

Flareless Tubes. The flareless tube is one of the newer kinds of metal tubing joints adopted by the air forces. It consists of a MS21922 sleeve and a MS21921 nut, and is generally used on heat-treated aluminum alloy or steel tubing. It is not recommended for soft tubing such as 52SO aluminum alloy.

Be sure to use the correct torque values when installing or pre-setting this connection. Undertorque may allow the tube or fitting to leak. Overtorque may set the sleeve into the tubing too deeply, and slight vibrations may cause a tube fracture or break in the male adapter fitting. When installing this fitting, be sure that the tubing fits directly into the unit or adapter. Misalignment can cause hard starting of the tubing nut, cross-threading, poor sealing, or fluid leaks. It is also essential that the tube be pushed against the adapter, and the tube nut then started by hand. Never use the nut to draw the end

of any tube to its mate. In a flare-type end this may collapse the flare, and in a flareless connection the nut might shear the sleeve across the tube. If the tube or pipe assembly does not fit properly, call a specialist to make the necessary adjustments and finish the job correctly.

Contamination Removal. Cleanliness is essential in manufacturing metal tubing and flexible hose. All metal filings, dirt, and other contamination must be removed from the finished assemblies. Contamination can be removed from both new and old fittings by washing in a cleaning solvent (P-D-680, a petroleum-base solvent), and then degreasing the components in a vapor solution of stabilized trichloroethylene. Where fabrication facilities are available, old metal tubing of less than ¼-inch outside diameter removed during maintenance should be replaced. This size tubing is very susceptible to residue accumulating inside the tube.

Large engine oil tubing and hose assemblies should be inspected periodically for flaky carbon deposits on the inside walls. If the cost of cleaning exceeds the cost of a new assembly, it should be replaced. Hose assemblies should be washed in solvent (P-D-680) and dried with forced air. They should never be submerged in a hot solution.

Corrosion control requirements of TO 1-1-2 must be strictly observed when new metal tubing is fabricated. The conversion coating (Mil-C-5541) should be applied to newly manufactured aluminum alloy tubing before the B-nuts and sleeves are installed on new assemblies. There are two reasons for this: (1) The nut and the coating can then be applied under the sleeve where it is most needed. (2) Dirt and moisture accumulating under the sleeve can develop into galvanic corrosion if this area is not protected. The solution should be used also to touch up any scratches that might be made during the flaring process.

Flexible Hose. The second category of aerospace plumbing is that of flexible hose. Many kinds of hose such as teflon, silicone compound, and synthetic rubber are used. The most important point in fabricating or replacing rubber hose is to know the maximum operating pressures and the types of fluids or gases that will be used.

Synthetic rubber hose, the most popular type used in aerospace plumbing, is divided into three pressure types: low-pressure (Mil-H-5593); medium-pressure (Mil-H-8794); and high-pressure (Mil-H-8788 and Mil-H-8790). The maximum operating pressure varies according to size and type. Be sure that the maximum operating pressure is known and that a safety margin is provided.

In fabricating a hose assembly, do not use low-pressure fittings or adapters on medium- or high-pressure hose, or vice versa. Each adapter or fitting is designed for a hose of a specific inside or outside diameter. Beware of homemade fittings such as those that are silver-soldered or welded. They may break or burst under pressure.

New Adapter Series. Hose fittings made by different vendors are not interchangeable. This applies primarily to AN782 and AN792, and the MS-28740 series of adapters. Corrective action has been taken through procurement of the MS24587 series, consisting of MS24588 and MS24589 nipples, and MS24590 and MS24591 sockets. However, the old series must be used until the new ones are available.

Reuse of old fittings often presents a problem when modified hose nipples are used with socket assemblies that have not been counter-bored or chamfered. Excessive torque is often applied in trying to maintain a 1/32- to 1/16-inch gap tolerance between the back of the B-nut and the socket. This squeezes the extra material on the hose nipple tight against the socket, and may strip the socket or nipple threads, or tear the sealing surface on the face of the nipple. In time, a leak will develop.

Overtorque is also a problem with the AN 818 B-nut on the hose assembling mandrel. The nut should be tightened only enough to hold the nipple stem. Otherwise, the weakest part of the nut may crack or break off when the back side of the tubing nut presses against the nipple. Overtorque also may crack the inside of the nipple stem.

A bench test may not reveal any of the flaws, but the vibrations and surge pressures generated by our high-speed aircraft and missiles may cause the components to fail and bring on a serious accident.

Flexible synthetic hose properly assembled and installed should give several years of satisfactory service. As it begins to deteriorate, rust and moisture also may affect the fine wire weave in the hose, or the hose assembly itself may harden and establish a permanent set.

The hose should be checked for these and other deficiencies each time the assemblies are removed during maintenance. It should be washed, inspected, and pressure-checked in accordance with NavAer 1-1A-8 requirements. When necessary, it should be replaced.

Unfortunately, in some instances, the responsibility for aerospace plumbing has been handed around to whatever shop would or had no choice but to accept it. If this is true on your base, remember that these components are either in condition to perform satisfactorily, or they are not in good condition and must be replaced. There is no in between.

—Adapted from Aerospace Maintenance

EJECTION SEAT MAINTENANCE

EJECTION seat maintenance is among the most difficult work to perform to a continually high standard. The work itself is not technically difficult but to maintain interest in the routine work can make considerable demands on the average man. The problem lies in the fact that for the life of the aircraft the ejection seat is essentially nothing more than a very complex armchair. The safety equipment man continuously reworks and maintains this system that is "never" used during normal operations. The lack of satisfaction from not seeing his equipment perform can lead to disinterest and ultimate boredom, which is the deadly disease affecting efficient seat maintenance.

Cases have come to light which indicate that an element of complacency has crept into some maintenance activities at all levels. A drogue gun was recently found with its coverplate incorrectly located. Despite the fact that this misalignment should have been obvious, the plate was tightened down, buckling the coverplate and leaving the mechanism incorrectly assembled. This is an example of unacceptable craftsmanship, as the worker knew how to do it properly but did not check the misalignment and correct it before clamping the coverplate in place.

Other cases, such as incorrectly rigged ejection seats, armed ejection seats without safety pins installed, face curtain handles worn down to the inner cable core and dirty, badly maintained seats have been found. These are all examples of a complacent it-will-do attitude. It will *not* do, because on the next flight the pilot's life may depend on the equipment in the aircraft. It always does.

Obviously the mechanic does not intend to overlook necessary quality required in his work. Boredom creeps insidiously upon him, and without his realizing it, the standard of his seat maintenance begins to decline until it is dangerous. To prevent this, interest in the day-to-day routine maintenance of the equipment must be kept alive. The seat shop must have a senior man in charge who has drive, interest and provides capable leadership to keep his men interested.

A senior man will ensure that seat shop problems will be brought to the attention of the supervisory personnel of the squadron. A case in point was an AME2 who was trying to maintain the squadron's ejection seats with only the corner of a storeroom available in which to perform his work. None of the responsible squadron personnel fully realized the safety aspects of this undesirable situation. These people had assumed that if the seat shop was having difficulties they would have heard about it. The only trouble was that the AME was not making himself heard. The seniors were only concerned when the seat was preflighted and just prior to its intended use. This case clearly illustrates the important part that leadership plays in the satisfactory maintenance of the squadron's survival equipment.

A unit that has senior personnel who are approachable and are aware of the needs and problems of the survival equipment shop has the key to successful seat maintenance. The senior shop personnel should know that they are able to discuss their problem with the maintenance officer and that the commanding officer is aware of their problems. This interest will be reflected in high standards and the best possible product.

Safety is an all hands responsibility; interest has to be stimulated and maintained. Safety equipment might be installed for years before it is needed. But when it is needed it must work immediately and correctly. When the day for its use arrives and it performs as advertised all concerned will have been repaid many fold.

—*NavAirLant Bulletin*

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NOTES

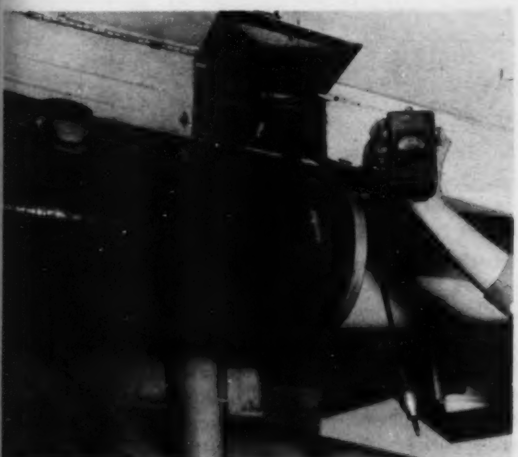
and comments on maintenance

Stray Voltage Check

AN ORDNANCEMAN checking for stray voltage erroneously removed a safety clip from the Aero 6A-1 launcher pigtail and plugged the pigtail into the self-test receptacle of a firing circuit tester. Upon applying tester voltage, three rockets fired from the launcher loaded on the A-4E's centerline bomb rack. Two rockets struck the nose landing gear.

Investigation revealed the AO had been instructed on stray voltage check procedures just the day before. The adapter cable from the aircraft was the only item that should have been connected to the tester to check for stray voltage in the aircraft's system but the AO thought he was also supposed to connect and check the pigtail from the rocket pack. Application of tester voltage while conducting a stray voltage check indicates a complete lack of understanding of the purpose and procedures of the stray voltage check.

Correct: Tester lead connected to aircraft rocket circuit. Thumb actuates switch controlling volt meter. Bailwire on aircraft circuit connecter is disconnected for photo purposes.



Incorrect: With tester connected to rocket pigtail and by depressing self-test switch (note thumb) voltage is directed to rocket causing firing.

The commanding officer commented that this potentially murderous and expensive incident suggests incomplete training procedures within the shops. A training program was established to cover all loading, arming and stray voltage check procedures. In addition, the squadron devised a modification to the firing circuit tester to prevent any recurrence.

Dirty Tanks Cause High Soap Readings

Medical doctors must use considerable care in interpreting symptoms prior to treating patients for suspected disease or illness. Sometimes due to special circumstances, symptoms are present without disease; hence treatment of a non-existent disease could complicate the health of the patient. In any event, the problem is one of isolating and correcting the root cause of the symptom.

And so it is with our jet engine doctors whose job it is to evaluate trouble symptoms and diagnose engine illness. Just as the medical doctor, a really sharp engine technician will search diligently for the source of the symptom. In many cases, he will find that the symptom is false—not related to a disease at all.

To illustrate, one activity experienced an excessive engine reject rate due to spectrometric analysis readings of high iron content in the lube oil. This symptom, if valid, indicates excessive wear in the engine, in some cases requiring extensive disassembly for corrective maintenance. Further, the symptom was unexpectedly present on some fairly low-time engines. As expert technicians should, these men searched for a logical explanation for the symptom—high iron content in the lube oil—and found it. They discovered that the inner walls of the lube oil tanks were contaminated with old sludge deposits not removable by conventional flushing procedures. These deposits contained metallic particles which evidently had accumulated over a long period of time—thus indicating only normal wear. The problem was corrected by removing the tank cover plates and thoroughly scrubbing and wiping the internal surfaces. For the past several months since introducing the tank scrubbing program, no excessive iron in the oil has been indicated at this activity by SOAP analysis.

A similar program by other activities would be advantageous to prevent unnecessary engine disassembly and to improve the value of symptoms generated by the spectrometric oil analysis program.

—*GE Jet Service News*

Torque is the Nuts

CONCERNING torque, this excerpt from "Tech Air," the Journal of the Society of Licensed Aircraft Engineers and Technologists, published in London illustrates the economic and safety advantages of bolt and nut combinations over rivet use:

"There is one classical example of an American suspension bridge where the structure was originally riveted. With various stresses, wind pressures, high traffic loading, . . . these rivets were continually working loose which resulted in a continuous program of changing rivets. As the men finished at one end they went back to the start.

"As an experiment, one half of the bridge had the existing rivets replaced with high tensile stainless steel bolts, nuts and washers, torqueloaded to standard loading requirements. Since this has been carried out there has been no slackening or loosening in any way on this half of the bridge. On the other half section the rivets have been removed and replaced several times since the experiment commenced."

Phantom Fasteners

HOW many fasteners of all kinds are there in a *Phantom?* What percentage of the aircraft's weight is devoted to holding it together? How much does it cost to buy and install a bolt or a rivet? You'll never guess.

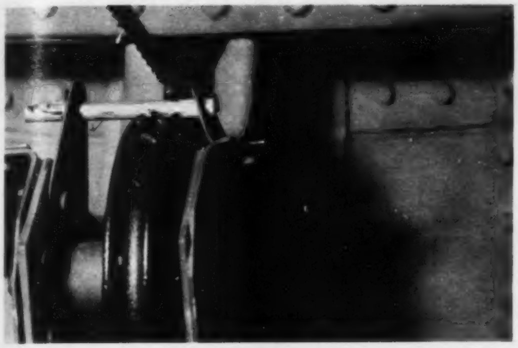
The answers to these and other interesting questions have been recently divulged in the internal newsletter of the MAC Producibility Department. Other than stumping your friends, these far-out facts may have no practical use in the operation of the aircraft; but if they increase your awareness of the importance of these small parts, they may somehow contribute to the conscientious maintenance of it.

On a gross basis, the average fastener in the F-4 weighs about 0.003 pounds, which appears to be a trivial bit of information. And it is, per se.

From a study of standard parts quantities, the number of fasteners required on the F-4 was determined to be about 643,000. The weight of these 643,000 fasteners is about 2100 pounds; that is, each F-4 contains over a ton of fasteners. The 2100 pounds of fasteners, in effect, amount to about 1700 pounds of added weight since 400 pounds of the fasteners' weight replace 400 pounds of material removed for fastener holes. Fasteners include solid, swaged collar and blind rivets; high strength blind fasteners, bolts, nuts and washers. Average cost per fastener .03, average cost installed .286. Total installed cost $202,970, over 4 times as much as an F-6F of yesteryear.

—*Adapted from McDonnell "Field Support Digest"*

Wire Trap

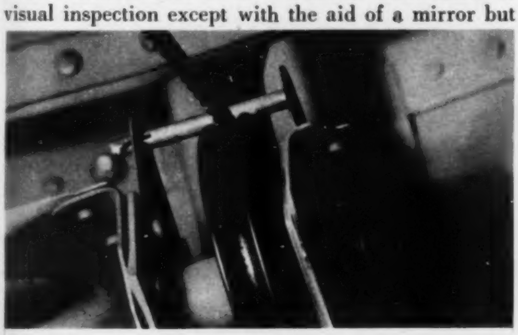


Misrouted cable

A MAINTENANCE booby trap was discovered after five flights following an SH-3A Calendar Inspection. The rudder/rotor cable was found with 2 broken strands and over 50 percent of the wires in the remaining strands broken over a three-inch area at the pulley.

The cable, which had been replaced during the last Calendar Inspection, had been misrouted over the retainer pin instead of under it. See photo above. Correct routing is shown in the photo below.

This critical area is in a location inaccessible to visual inspection except with the aid of a mirror but



Correct cable routing

can be detected by feel. When viewed facing aft the cable appears to be completely normal even when misrouted. An alert AMH3 was credited with the discovery.

A message recommending a one-time inspection warned other H-3 operators of this booby trap. It is recommended that rudder cable removal and installation be in strict accordance with the maintenance instructions contained in NavWeps 01—230HLC-2-2.

—Contributed by J. S. Brown, ASO and AMH3 D. Rodrick HS-10

Cast Iron Not for Heavies

A CAST iron drain hole cover shattered when an F-4B weighing an estimated 48,000 pounds was towed over it. The left main mount dropped and wedged in the drain opening, rupturing the 26-ply tire.

The width of the opening prevented the main mount dropping all the way into the drain and damaging the strut and fully fueled external wing tank. This never would have happened if the wheel had been aligned lengthwise with the drain. The aircraft was hoisted out without further incident.

Although this particular drain cover was cracked, authorities stated that cast iron is unsuitable for drain covers frequently subjected to high stress loading.

Pending replacement with steel grating, frequent inspection of cast iron covers is recommended. Line and flight crews are cautioned to avoid crossing drains during towing and taxiing. To avoid a similar mishap, take a good look at your drain covers and gratings—recall the *Stoof* dropping through which was reported here recently? Similar corrective action may be necessary at your activity.

Personal Responsibility

AT 1500 ft with cruise power set, the first indication of engine malfunction in an S-2F was a runaway port propeller. Attempts to keep the RPM within limits appeared to be fruitless, and when the pilot observed oil beginning to cover the port nacelle he initiated feathering procedures. The engine was secured by the checklist, and the chip detector light came ON just before the prop went to FULL FEATHER. An uneventful landing followed.

Inspection later revealed a large amount of metal in the sump, but no oil in the engine. The oil pressure relief valve adjusting screw and outer cap were also missing.

A gripe of low pressure had previously been written up on the engine, and it is suspected that after a pressure adjustment was made, the valve cap was not properly torqued down or lock-wired. After the aircraft became airborne, the outer cap worked off and the adjusting screw gradually backed out from engine vibration. Before too long, all engine oil and an R1820 were lost.

From the Commanding Officer's comments and recommendations:

The cause of this engine failure was clearly a case of neglect on the part of several personnel: the men who worked on the engine, the quality control inspector who was supposed to inspect the completed work, and the shop supervisor who was sup-

Continued next page

posed to ensure that the aircraft was up for flight. Investigation determined that a lack of coordination was involved between day check and night check personnel, and between Power Plants and the Electric Shop. Because of the failure on the part of several men to assume *personal responsibility*, a job was not completed and the aircraft was cleared for flight.

There are no . . . simple recommendations that can be made in order to prevent similar incidents in the future. The system that the squadron utilizes for completion of all job orders is sound, if individuals perform their duties properly. Negligence can only be completely prevented by instilling in every man a sense of responsibility and initiative, and a feeling of pride in his work. Every man must be so dedicated to doing his job well that he will not be satisfied until he is certain that the job is satisfactorily completed. Officers and petty officers must continually attempt to instill such dedication through lectures, personal contacts and leadership by example.

Old Habits

DAMAGE was discovered by line personnel after the A-4A returned from a scheduled two-plane-section flight. The main fuel tank door assembly was missing and a 4 x 5 inch hole was in evidence near the top of the vertical stabilizer. The pilot was unaware of any damage to his aircraft in flight, and the section leader was likewise ignorant of the incident.

On preflight the pilot observed the door to be flush, but could not recall the condition of the cam locks. Since the aft cam lock was still attached to the aft cam lock hole after the landing, it is probable that the door tore off in flight when the front fastener gave way. The door then blew back and tore off at the rear fastener.

A second incident of failure to secure the same door on another aircraft was caught by another pilot on preflight for the same morning launch. The command had recently obtained A-4As to replace their A-4Bs. On the A-4B with pressure fueling capability, the door in question is not normally opened. But on the A-4A without the pressure fueling capability, the door must be removed for every fueling operation.

It would appear that this is another case of an old reaction being insufficient for a different piece of hardware.

Cleaning Solvents

JUST because a cleaning solvent is approved for a specific job does not mean it is safe to use without taking any precautions. This was recently demonstrated when a crewchief removed a section of engine cowling and doused the oil covered engine with solvent. The engine which had been shut down minutes earlier was still hot, causing the solvent to vaporize and ignite, extensively damaging the engine and remaining sections of cowling.

Fire is only one danger. Toxic effect of vapors and irritation from skin contact are others. When working with cleaning solvents, always keep the following in mind:

1. Any mineral base solvent is capable of igniting spontaneously at some specific temperature. Always make sure the engine is "cold" before spraying with solvent, and use only in areas free from open flames.
2. Vapors of solvents are toxic. Always use in a well ventilated area.
3. Solvents can irritate the skin. Remove saturated clothing as soon as possible and cleanse skin.
4. Should any solvent be accidentally swallowed, consult a physician immediately.
5. Always use an approved solvent for the job to be done, and keep in mind that special precautions may sometimes be required. Some solvents used to degrease engine parts, for example, are so potent that any skin contact requires medical attention.

If ever in doubt about what precautions are necessary, check the manufacturer's warning label.

Flight Deck Power Cable Stowage

MANY instances of improperly stowed cables have resulted in short circuits, burned cables and damaged electrical equipment. Since power is essential for maintenance and starting aircraft, the loss of power stations seriously hampers the preparations for flight operations.

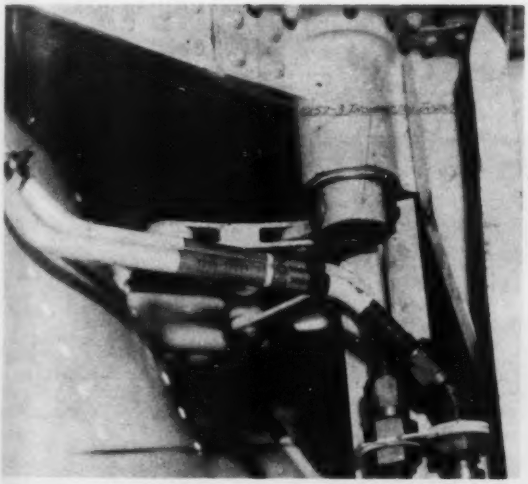
After each use power cables should be replaced in the cable trunk, power turned OFF, waterproof canvas cover placed over the cable head and the hatch secured.

Supervisors should ensure that all users are aware of the need for proper stowage of power cables, and that regular and systematic checks are made upon power stations to ensure compliance with storage requirements.

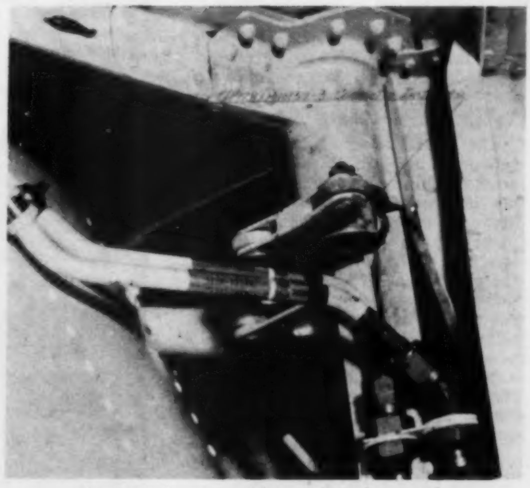
—USS Constellation

MURPHY'S LAW *

A-6A Murphy



Incorrect—Arm assembly reversed and mispositioned 180 degrees



Correct—Arm assembly positioned properly

DURING ground cycle check of the landing gear following incorporation of Interim Airframe Bulletin 41 the gear operated normally. But on emergency operation, the nose gear extended and the MLG remained in the wheel well after the gear doors extended to the open position.

Investigation revealed arm assembly PN 128 LM-10152-3 installed in reverse and 180 degrees out on crank shaft PN 128LM10015-1 causing incorrect throw and failure of the arm against the adjacent structure. Ref: NavWeps 01-85ADA-4-3 Fig and Index No. 3-12-10, Main Gear Aft Door Lock mechanism.

It was recommended that A-6 operators inspect this installation following compliance with IAFB 41 for correct installation of arm assembly PN 128LM1052-3. In addition, Engineering Analysis was requested to determine a more suitable method of part identification to insure correct installation and that Caution Notes be incorporated into MRCs and MIMs.

—Contributed by VMA (AW) 242, MCAS, Cherry Point

*** If an aircraft part can be installed incorrectly, someone will install it that way!**

Letters

Will To Survive

The overall tenor of correspondence generated by CDR Wynn F. Foster's article, "Will to Survive" in the December 1966 issue of APPROACH reflects a high level of interest on the part of both military and civilian readers. It also indicates that the story has achieved the purpose for which it was written—that is, to show what can be done, under the adverse conditions most likely to be found in a survival situation, with plain determination and courage.

Excerpts from letters illustrate the reception which the article received:

—"The Sunday Chicago Tribune, dated Dec 11, 1966 ran an article ("Will to Survive") . . . quoted from your publication, APPROACH.

"Would you please send me one or two copies of this particular issue if any are still available? I intend to use it to show my psychology students how procedures thoroughly learned in training stand by an individual when he is placed in an actual emergency situation.

"In shock and in the face of extreme personal danger . . . the author acted purposefully and with reason and, because of his proper training, did much to insure his safe recovery."

—"I feel that the safety publications should be aimed at the people doing most of the flying, i.e., those out here in combat. The December APPROACH had an excellent story about an A-4 skipper . . . Our people got a lot of good ideas from that one article."

Articles from fleet operating squadrons recounting non-classified combat theatre experiences are openly solicited in the hope that by passing along such information, others may profit.—*Editor*

T-34 after encounter with bird.

Aircraft Bird Strike

Midway Island—Last week we had a bird strike with our station helicopter which I thought might interest you. The CH-19E had just lifted-off and was at about 50 ft, moving forward at 40 kts. The Gooney Bird came in from about the one o'clock position. He broke the windshield and bent its frame on the pilot's side. The bird fell to the ground, dead. The aircraft was immediately landed without further damage.

Repairs were completed the same day and the aircraft was flying the following morning.

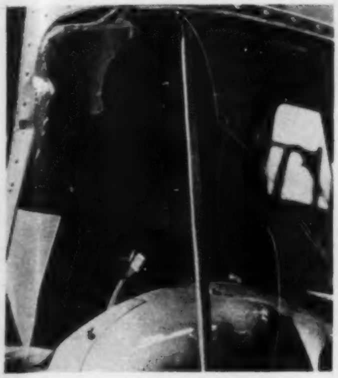
The Gooneys have returned to Midway in full force so we have our warning flag up.

LT DANIEL R. TOLENO

• Such incidents seem to occur with steady regularity and are not isolated to any particular area. Along with your picture, we have included another showing bird damage to a T-34B in the Pensacola area.

APPROACH welcomes letters from its readers. All letters should be signed though names will be withheld on request.

Address: APPROACH Editor, U. S. Naval Aviation Safety Center, NAS Norfolk, Va, 23511. Views expressed are those of the writers and do not imply endorsement by the U. S. Naval Aviation Safety Center.



Bird damage to CH-19E.

Nonslip Plug

N. S. Adak—During cold weather operations there have been occurrences of personnel slipping on the entrance ladder. Besides the ice which clings to the shoe soles, we have found the anti-ice solution which is sprayed on the aircraft, also makes the ladder extremely slippery.

To eliminate this hazard we have painted the entrance ladder steps with—Walkway, Coating and Matting, Nonslip, Aircraft—5610-641-0427. Even during dry conditions it is considered advantageous.

LT C. L. SIMONSON
ASO, VP-6

• Sounds very promising.

Flare Labels

El Centro, Calif.—The excellent presentation on pages 24 and 25 of the October 1966 APPROACH was of particular interest to me, having battled and cussed this piece of equipment through many a survival training lecture and training period. The information as presented will make an eye-catching bulletin board item for either the ready room or the survival equipment issue room.

As noted in the article, large numbers of these distress signals with improper instructions will remain in use and stocked in the supply system for a considerable time. Though APPROACH does get wide distribution this does not insure that the word shall get to all hands. the Mk 13 Mod O distress signal is normally used under extreme environmental, physiological and psychological conditions. Memory recall becomes most difficult concerning instructional information passed on in this manner.

I recommend that these new detailed instructions be printed on a pressure sensitive label, which would be resistant to the wide environmental conditions and use to which the signaling device is exposed. This label, to cover the old instructions, with "one time" inspection requirements, application methods and recommended training procedures should be the subject of an Air Crew Systems Bulletin.

M. TERNES,
AV. SURV. EQUIP. TECHNOLOGIST
NAVAL AEROSPACE RECOVERY FACILITY

• We are forwarding your letter to the Naval Air Systems Command Headquarters for referral to the cognizant desk. Your interest in improving aircrewmen's survival equipment is greatly appreciated.

Aviation Physical

Washington, D.C.—"The Aviation Physical" in the November, 1966 APPROACH was an outstanding article. I thought it odd, however, that the "victim" in the photographs was not identified. The smiling patient was CDR Troy E. Todd, USN, with whom I had the privilege of working in VP-17. He is to become CO of VP-8 in the very near future.

YN2 MICHAEL C. WHALEN
OFFICE OF INFORMATION
NAVY DEPARTMENT

• CDR Todd was chosen at random from a group of officers waiting to have their physicals the morning the APPROACH photographer visited the NAS Norfolk Dispensary. Because it was decided to dispense with captions for the photographs illustrating the article, CDR Todd was not identified.

Source Pubs for Aircraft Handling Signals

Washington, D.C.—Re: "Line Safety," Dec. issue: concerning aircraft handling signals. Some NATOPS Flight Manuals contain many handling signals, others contain only a few. An effort is being made to remove all handling signals from NATOPS Flight Manuals except those peculiar to the subject aircraft.

The following are the approved references for aircraft handling signals:

- NWP 41B—Naval Air Operations—Aircraft Handling Signals. Helicopter Handling Signals (Also in NWIP 41-6(B).
- CVA/CVS NATOPS—Handling Signals peculiar to carrier operations.
- NATOPS Flight Manuals—Handling Signals peculiar to the subject aircraft.
- NWP 41 (B)—Inflight Signals and various other signals concerning aircraft operations.

An additional, "No Brakes" signal (page 42) was approved and is incorporated in the recent revision to the CVA/CVS NATOPS Manual.

J. A. SWANK
O-IN-C
U.S. NAVY TACTICAL
DOCTRINE ACTIVITY

• Your source document information is appreciated.

Vol 12 **approach** No 9

Our product is safety, our process is motivation and our profit is measured in the preservation of lives and equipment and increased mission readiness.

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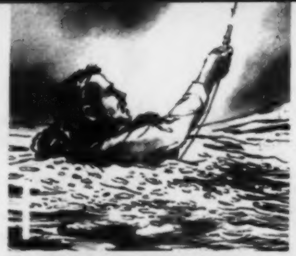
DEPARTMENTS



NavWeps 00-75-510

CREDITS

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Page 6: Photo, courtesy Lockheed, California.

Page 36, 37, 38: Photo, courtesy Aerospace Maintenance.

IBC: Photo, courtesy PHAN D. A. Wilding, VP-21

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RADM Paul D. Buie, Commander, U. S. Naval Aviation Safety C[illegible]

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Safety in depth requires that each man: acknowledge the effect his work may have on others; lay aside his apathy in the face of routine; apply himself to the limits of his ability; and have enough respect in himself to profit from the experience and direction of just supervision.

LIFT and DRAG